3.0 ENVIRONMENTAL ANALYSIS

Descriptions of the natural, human, and cultural environmental resources present in the project area are presented below by resource. For the purposes of this analysis, the project area for each resource includes all land within the project area boundary depicted on the maps unless otherwise noted. Direct and indirect impacts of the Proposed Action and the No Action Alternative are identified for each resource. Where mitigation above and beyond Western's standard mitigation measures are recommended, mitigation measures specific to the various resources are also discussed.

3.1 CLIMATE AND AIR QUALITY

3.1.1 Environmental Setting for the Proposed Project

3.1.1.1 Climate

The regional climate in the project area is semi-arid and continental, with warm (sometimes hot) dry summers and cold dry winters typical of the Great Plains (Amen et al. 1977). Average maximum temperatures at Sterling (25 mi south of the site) are highest in July (90.1ºF) and lowest in January (39.0ºF) (Table 3.1) (Western Regional Climate Center [WRCC] 2004). Average minimum temperatures are also highest in July (59.2ºF) and lowest in January (11.2ºF). Monthly precipitation at Sterling ranges from a low of 0.28 inches in February to a high of 2.78 inches in May (see Table 3.1). Annual precipitation averages 15.27 inches (WRCC 2004), most of which falls during the growing season (U.S. Forest Service 1997). Annual snowfall averages 20.5 inches. Snowfall can occur 9 months of the year, with highest snowfalls in January (4.0 inches) and least (of the 9 months) in May (0.1 inch); since 1948, no snow has been recorded in June, July, or August. Average snow depth December through February is 1.0 inch.

The site is located in a Class IV wind area (National Renewable Energy Laboratory 2004); Class IV areas are defined as having good wind power development potential. Wind speeds at 164 ft above the ground average 16.6 to 17.7 mph. Prevailing winds are from the northwest (Figure 3.1).

Table 3.1 Period of Record Monthly Climate Summary for Sterling, Colorado.

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Average max. temperature	39.0	45.3	52.2	62.6	72.3	83.3	90.1	88.1	78.7	66.7	50.9	41.2	64.2
Average min. temperature	11.2	16.7	23.6	33.4	44.2	53.7	59.2	57.0	46.3	33.8	22.0	13.7	34.6
Average total precipitation (inches)	0.31	0.28	0.86	1.22	2.78	2.73	2.55	1.75	1.10	0.89	0.50	0.29	15.27
Average total snow fall (inches)	4.0	3.0	4.2	2.0	0.1	0.0	0.0	0.0	0.2	0.2	3.3	3.3	20.5
Average snow depth (inches)	1	1	0	0	0	0	0	0	0	0	0	1	0

[1] Source: WRCC (2004).

3.1.1.2 Air Quality

The Pawnee National Grassland, located about 25 mi west of the site, is within the Front Range airshed (U.S. Forest Service 1997), and since there are no physical barriers between the grasslands and the project area, it is assumed that the project area is within the same airshed. Air quality in the Front Range is designated as attainment for all criteria pollutants, sulfur dioxides, nitrogen oxides, particulate matter, and ozone. Mobile and area sources from Front Range urban areas may impact the more rural areas in eastern Colorado. Other pollutant sources include the nine large power plants that operate within the airshed (personal communication, January 2005, with Francisco Escobedo, U.S. Forest Service, Pawnee National Grassland), oil and gas development, urbanization, agricultural activities, prescribed burning, dust and particulate emissions from roads, tailpipe emissions, and off-road vehicle traffic.

3.1.2 Environmental Impacts and Mitigation Measures

3.1.2.1 Significance Criteria

Impacts to air quality would be considered significant if emissions from construction would violate any state or Federal air quality standards.

3.1.2.2 Impacts of the Proposed Project

Climate would not be impacted by the proposed project (Keith et al. 2004).

Possible adverse impacts to air quality would occur during construction and operation due to short-term increases in particulates (e.g., dust from excavation and vehicle traffic) and tailpipe emissions from construction and operations vehicles.

During operation, using wind power instead of burning fossil fuels to generate electricity would have beneficial impacts on air quality because greenhouse gases and other pollutants emitted by conventional fossil fuel combustion would not be produced. The term "beneficial" is used to describe the favorable impact of using a nonpolluting resource to generate electricity; it does not reflect any proactive clean-up to improve air quality. Operation also would result in small amounts of dust and tailpipe emissions from O&M vehicle traffic.

It is not anticipated that any state or Federal air quality standards would be exceeded due to the construction or operation of the project and potential adverse impacts to air quality would not be significant. The project is expected to be in compliance with National Ambient Air Quality Standards.

3.1.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, no dust or tailpipe emissions would occur due to project construction or operation. Conversely, the opportunity to generate electricity using a non-polluting resource would be lost.

3.1.2.4 Mitigation Measures

Mitigation for impacts to air quality would include the following:

- dust abatement techniques (e.g., spraying water) would be used on unpaved and unvegetated surfaces to minimize dust emissions;
- SCE and its contractors would post and enforce a speed limit of 25 mph on roads developed for the project to reduce fugitive dust emissions from traffic;
- disturbed soils or construction material (e.g., concrete) would be covered if they become a source of fugitive dust;
- areas to be blasted would be covered with blast mats; and
- disturbed areas would be reclaimed and revegetated as soon as possible after construction.

3.2 GEOLOGY, PALEONTOLOGY, AND SOILS

3.2.1 Environmental Setting for the Proposed Project

3.2.1.1 Geology

The major physiographic feature in the area is Peetz Table, a large gently sloping plateau that rises several hundred feet from the plains to the south. The majority of the project area is flat to gently sloping; the southern portion is rolling. The only dissected area is in Sections 31 and 32, T12N, R50W, at the head of Spring Canyon. The project area is underlain by the Ogallala, Arikaree, and White River Formations (Tweto 1979) (Figure 3.2).

The area has low seismic potential and no earthquakes have occurred in the area historically (Colorado Geological Survey 2002). No sand dunes occur in the project area. The steep slopes along Spring Canyon may be subject to slides, but most of the project area is relatively flat to rolling (Amen et al. 1977) so landslide potential is low. Abandoned caliche quarries occur in the project area, but no underground mining occurred, and thus there is no potential for mining-related ground subsidence. Sink holes or other underground features that could cause subsidence are not known to occur in the project area. Project facilities would not be located in floodplains (see Figure 3.7).

The only mineral known to occur in the project area is caliche, which was quarried in the past but is not currently being recovered. No oil, gas, or coal fields occur in the project area (Smith et al. 1991, Tremain et al. 1996). The project area is within a region known to contain other industrial minerals (e.g., clay, sand, and gravel) (U.S. Geological Survey 1968), but none are actively mined in the project area.

3.2.1.2 Paleontology

Ogallala Formation. The Ogallala Formation is a fluvial deposit locally subdivided into an upper and lower unit. Only the upper unit occurs in the project area. This unit, which varies from 40 to 450 ft thick, underlies Peetz Table and is considered equivalent to the Ash Hollow Member of the Ogallala Formation as described by Condra and Reed (1959). The upper part of the upper unit contains a pale red or very pale orange dense pisolitic caliche layer or limestone that is locally brecciated and recemented and crops out as a bench-forming caprock that is about 2 ft thick. In nearby Nebraska, this and some underlying beds are called the Kimball Member of the Ogallala Formation. The Ash Hollow Member forms erosion-resistant ledges and is characterized by mortar beds, grayish-orange–pink pebbly sand, and silt firmly cemented by calcium carbonate or, locally, opal. Unconsolidated gravels included in the member consist of rounded clasts of granitic, sedimentary, and volcanic rocks. Layers of light-brown and yellowish-gray silt beds of silver-gray, biotite-rich volcanic ash also occur in the upper part. As described below, Tedford (1999) included a fluvial deposit that underlies the rocks of the Ogallala (as mapped by Scott [1978]) and truncates older deposits in the Ogallala Formation.

Arikaree Formation: In the project area, the Arikaree Formation as mapped by Scott (1978) includes fluvial deposits equivalent to the Marsland Formation of Schultz (1938) and Arikaree Formation as described by Wilson (1960). In his mapping, Scott indicated that he included only rocks of the Martin Canyon beds (rocks that yield fossils of the Martin Canyon local fauna) in the Arikaree Formation. These deposits include between 20 and 150 ft of chiefly gray to brown moderately consolidated conglomerate, sandstone, siltstone, and claystone and minor amounts of gravel and sand. They typically form rubble of biotite-rich, ashy, calcareous siltstone nodules that are dominantly oval. This rubble is usually developed at the top of the formation but can occur anywhere in the formation. Gravel within the formation is cross-stratified and contains clasts of siltstone, quartz, feldspar, and plutonic and volcanic rocks as large as 10 inches. Sand is fine to coarse, loose to friable, and cross-stratified, and commonly occupies channels cut into the next lower bed or into underlying beds of the White River Group.

The cut-and-fill nature of the Arikaree Formation and related formations (Pawnee Creek) make stratigraphic relationships complicated. For example, Galbreath (1953) included the Martin Canyon beds (which Scott mapped as the Arikaree Formation) in the Pawnee Creek Formation. Tedford et al. (1987) noted that the Martin Canyon beds underlie the Pawnee Creek Formation and are separated from that formation by a major disconformity. This would make the Pawnee Creek Formation a separate and younger valley fill deposit. As conceived by Tedford et al. (1987), the Pawnee Creek Formation consists of tuffaceous silty sandstones showing complex cut-and-fill structures and contains conglomerate lenses and abundant lenticular vitric tuffs. At its type area, the Pawnee Creek Formation (minus the gravels removed from inclusion in the formation by Tedford et al. [1987]) fills the course of a single river valley that occupies a sinuous course through the Pawnee Buttes area of Colorado. Dated ash beds in that area document that the Pawnee Creek Formation accumulated between about 14.0 and 14.5 million years ago (Tedford 1999). These deposits and their abundant fossil fauna are of particular scientific significance because they fill an important hiatus in the classic Nebraska sequence.

In some places in Logan County, a younger fluvial deposit cuts through the underlying Pawnee Creek Formation, truncating it and the underlying Martin Canyon beds to rest unconformably on the White River Group (Figure 3.3). Tedford et al. (1987) amended the definition of the Pawnee Creek Formation as originally proposed by Galbreath (1953) in Weld County, Colorado, and removed similar gravels from the formation definition and referred them instead to the overlying Ogallala Formation. It is unclear if the gravels in Logan County are the same as those removed from the Pawnee Creek Formation by Tedford et al. (1987). It is also unclear if the rocks included by Scott (1978) in the Arikaree Formation are referable to the Martin Canyon beds or the Pawnee Creek or Ogallala Formations or if they represent a separate unnamed unit. The relatively younger age of the Ogallala Formation (as shown by fossils in the Wray, Colorado, area) strongly suggests that this unnamed unit represents a separate fluvial deposit of

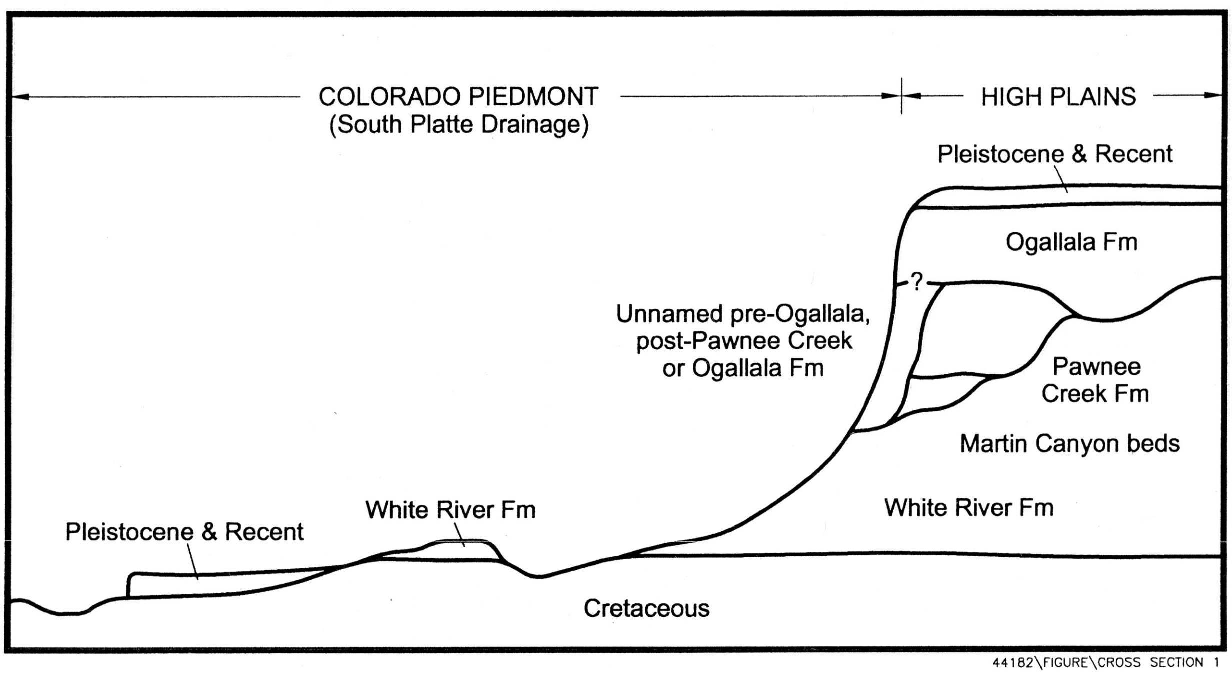

Figure 3.3 Schematic Cross Section of Beds in Logan County, Colorado, Between the South Platte River and the Northern Boundary of the State (Modified from Galbreath [1953]). Martin Canyon Beds Occur Below the Pawnee Creek Formation = Arikaree Formation of Scott (1978.)

pre-Ogallala, post-Pawnee Creek age (Figures 3.4 and 3.5). The name Arikaree Formation as applied by Scott (1978) should probably be abandoned in favor of the Pawnee Creek Formation in Logan County, Colorado.

White River Group. Scott (1978) mapped the upper part of the White River Group along Peetz Table as the Brule Formation. These same deposits have been called the Vista Member and Cedar Creek Beds of White River Formation by Galbreath (1953) and Matthew (1901), respectively. The Brule Formation is predominantly gray to pale-brown or reddish-brown sandy to slightly clayey and ashy mica-bearing siltstone. The siltstone ranges from soft and plastic to hard and blocky. The upper part is equivalent to the Whitney Member of Schultz and Stout (1938) and contains small calcareous nodules. A little lower in the section is a white calcareous marker horizon that forms a conspicuous band on the south edge of Peetz Table. The remainder of the Brule Formation underlying this band consists of a thick lenticular pale-red or reddish-brown crossbedded friable, pebbly, cobbly, hard, micaceous channel-form sandstone and siltstone sequence that contain siltstone clasts and granitic gravel. These deposits are thought to be equivalent to the Orella Member of the Brule Formation as described by Schultz and Stout (1938).

History of Vertebrate Paleontological Investigations. The history of vertebrate paleontological investigations into the Tertiary beds of northeastern Colorado up until the late 1950s is summarized by Galbreath (1953). Additional paleontological work through the mid 1980s is summarized by Tedford et al. (1987, 2004). From these accounts, the first vertebrate paleontologist to work in this area was O.C. Marsh, who in the summer of 1870, noted the occurrence of "*Titanotherium* beds" along the Chalk Bluffs in western Weld County, along with overlying beds of the White River Group. Marsh noted that the White River Formation was marked by the abundant fossil remains of oreodonts. Marsh's protagonist, E.D. Cope, visited the region in 1873 and again in 1879 and noted the general similarity of the Tertiary beds of northeastern Colorado to those in Nebraska and South Dakota. In 1874, Cope published a major work on the results of his expeditions. In 1898, 1901, and 1902, field parties from the American

Museum of Natural History (AMNH) led by Matthew, Brown, and Thomson explored Logan and Weld Counties (Osborn 1918). The second and last major work published on the region (Matthew 1901) resulted from these expeditions.

Subsequent to the work by the AMNH and through the 1930s, field parties from the Denver Museum of Natural History (now Denver Museum of Natural Science [DMNS]), University of California, Childs Frick, and University of Kansas collected fossil vertebrates from the region. In 1940, Dr. G. Edward Lewis, with the U.S. Geological Survey (USGS) in Denver, and Dr. Robert W. Wilson began intensive work in the area that was interrupted by World War II. In 1946, Dr. C.W. Hibbard led a field party from the University of Kansas. In 1958, E.C. Galbreath published the results of his studies, which remains the most comprehensive work on the region to date. Tedford et al. (1987, 2004) and Tedford (1999) summarized the biostratigraphic implications of the late Oligocene to Pliocene rocks of northeastern Colorado.

The Ogallala Formation (Ash Hollow) rocks that cap the local geologic section in Logan County are traceable to the east, where they occur as outcrops along the Republican River near Wray in Yuma County, Colorado. There, Cook (1922a, 1922b) reported the presence of fossil vertebrates of early Hemphillian age (see Figure 3.5) comparable to fossils from localities in nearby Nebraska.

Tedford (1999) and Tedford et al. (2004) removed the upper gravels from the type section of the Pawnee Creek Formation and included them instead in the overlying Ogallala Formation; however, these deposits that yield fossil vertebrates that comprise the Kennesaw, Vim-Peetz, and Sand Canyon local faunas (see Figure 3.5) (Galbreath 1953) appear to be significantly older than those found at Wray, Colorado. It is more likely that these fluvial gravels represent an unnamed formation that pre-dates the Ogallala Formation and post-dates the Pawnee Creek Formation. These unnamed deposits yield fossils of insectivores, shrews, rodents, mustelids, canids, elephants, horses, rhinos, and oreodonts.

Fossil vertebrates from the Pawnee Creek Formation include specimens from several localities collectively referred to as the Eubanks fauna (near the base of the formation) by Galbreath (1953) and Keota fauna from higher in the formation (Tedford 1999) (see Figure 3.5). Fossils from lower in the formation include beavers, horses, rhinos, oreodonts, camels, canids, amphicyons, and deer. Fossil vertebrates from the upper part of the formation include the first elephants in North America that represent both mammutids and gomphotheriids.

Fossil vertebrates from the Martin Canyon beds (see Figure 3.5) are significantly older than those from the overlying Pawnee Creek. This observation supports the presence of a major disconformity within the Pawnee Creek Formation as previously defined. Thus, the Martin Canyon beds represent a separate, older fluvial deposit that should not be included in the Pawnee Creek Formation. Fossils from the Martin Canyon beds include shrews, moles, rabbits, rodents, canids, horses, rhinos, peccaries, oreodonts, camels, and deer.

Fossil vertebrates from the Vista Member of the White River Formation (see Figure 3.5) include marsupials, shrews, rabbits, rodents, horses, oreodonts, camels, and hypertragulids, and primitive deer.

In 1979, the Colorado Scientific Society conducted a spring field trip to study the geology and paleontology in the Sterling, Colorado, area. The trip was led by Glenn Scott, Ed Lewis, and Norm Denson. The trip made stops at several fossil vertebrate localities in the White River (Brule), Arikaree, and Ogallala Formations in the vicinity of the project area. These included the following:

- Brule Formation in T11N, R52W-R53W, at a locality where it was noted that the remains of the camel *Leptauchenia*, artiodactyl *Leptomeryx*, rabbit *Palaeolagus*, and rodent *Paradjidaumo* were collected;
- Arikaree Formation in T11N, R53W, at a locality where remains of the oreodont *Merycochoerus* were collected; and
- Ogallala Formation in T11N, R52W-R53W, at a locality where remains of the horse *Merychippis*, camel *Alticamelus*, and rodent *Mylagaulus* were collected; and at

another locality in T11N, R52W, where fragments of rhino and tooth and bone fragments of an unidentified artiodactyl where collected.

An online catalogue of AMNH (2004) fossil localities noted fossils collected in the Pawnee Creek Formation in Logan County during the 1901 survey described earlier, including the following localities and specimens of tortoise:

- AMNH 11043 - a nearly complete shell of subadult *Geochelone osborniana* (a tortoise);
- AMNH 11044 - nearly complete shell of *Geochelone osborniana*;
- AMNH 11045 - two subadult shells of *Geochelone osborniana*;
- AMNH 11046 - five shells of *Geochelone osborniana* (three collected, others weathered and broken), another shell of *Geochelone osborniana* with postcranial bones, and a 15-inch shell of *Stylemys*;
- AMNH 11048 - a very large shell of *Geochelone osborniana*;
- AMNH 12422 - a skull and shell of *Geochelone osborniana* (holotype), skull and limb bones of *Geochelone pansa* (holotype), and postcranial bones of *Testudo* sp.; and
- AMNH 12432 - toe and dermal bones of *Testudo* sp.

Unfortunately, in 1901, poor locality records were kept and the exact locations of these sites within Logan County are unknown.

<u>Paleontology within the Project Area</u>. Search of records of the Colorado University (CU) Museum (Culver 2004) and DMNS (Ivy 2004) did not reveal any fossil localities within the townships encompassed by the project area. Culver (2004) noted, however, that the CU Museum had many localities in the White River Group and Arikaree Formation in neighboring townships to the west. The Museum of Paleontology at Berkeley has yet to respond to the locality search request.

The absence of known fossils in the Ogallala and Arikaree Formations and White River Group within the project area may be due to the following:

- absence of outcrops,
- absence of fossils in outcrops, or
- lack of work in the area by paleontologists.

It is unknown which of these, or what combination of these three factors, is responsible for the lack of known fossils and fossil localities in the project area.

Based on the literature, and in the absence of specific field data about outcrops in the project area, the Ogallala Formation, Arikaree Formation (which probably includes Pawnee Creek Formation and unnamed younger deposits), and White River Group have a high potential to contain fossils of scientific significance. These deposits and their abundant fossil fauna are of particular scientific significance because they fill an important hiatus in the classic Nebraska sequence.

On March 3 and 4, 2005, a field reconnaissance of the project area was conducted to determine the nature and extent of paleontological resources of potentially impacted areas within the project boundaries.

Few areas of rock outcrop occur in the project area. Exposures along the margins of the Peetz Table escarpment are very poor, and the top of the tableland is marked by alluvial terrace gravels and thin, loess-rich soils and no outcrops. The top of the Peetz Table varies from essentially flat to undulating, and the crests of most hills or rises forming the top of the tableland show exposures of weathered sediments of the Ogallala Formation.

The only well-exposed rock within the project area belongs to the Ogallala Formation where it is exposed in a few steep cliffs along Spring Creek Canyon. These and other Ogallala exposures were examined for the remains of fossil vertebrates. A few bone fragments, possibly the remains of the shaft of a tibia of an unknown artiodactyl were discovered in the SWNWSE, Section 32, T12N, R50W. The bone is so poorly preserved that the find is scientifically insignificant. No other vertebrate remains were found in the project area; however, the trace fossils of plants, invertebrates, and (probably) mammals are locally abundant.

3.2.1.3 Soils

Twenty-nine soil types occur within the project area (Appendix A). The predominant soil type on Peetz Table is the Platner-Rago-Dacono loam. Of the more common soils in the project area, most are deep and well-drained with slow to moderate permeability. Potential for water and wind erosion is slight to moderate. Badlands that occur adjacent to Spring Canyon are relatively steep and actively eroding and would be avoided during project construction. The Dix-Eckley complex, Altvan-Eckley sandy loams, Dix-Altvan complex, and the Ustic torriorthents have high potential for erosion (Figure 3.6), and additional measures above and beyond best management practices may be needed to control erosion if these soils are to be disturbed. None of the soils in the project area are classified as prime farmland (Amen et al. 1977).

3.2.2 Environmental Impacts and Mitigation Measures

3.2.2.1 Significance Criteria

Impacts associated with geological features would be considered significant if undercutting or subsidence caused the collapse of a turbine. Impacts to mineral resources would be considered significant if economic extraction of mineral resources is precluded. Impacts to paleontologic resources would be considered significant if important paleontological resources are disturbed without appropriate scientific data recovery. Impacts to soils would be considered significant if:

- highly erosive soils on moderate to steep slopes (15-20% slopes) are disturbed and cannot be stabilized to predisturbance conditions within 5 years; or
- vegetative productivity is eliminated due to compaction caused by construction activities.

3.2.2.2 Impacts of the Proposed Project

Geology. The proposed project would not impact the area's physiography. Minor impacts to topography would include temporary or permanent changes in the land surface and slope due to cut-and-fill activities required to excavate foundations and build roads. Any cut-and-fill areas that are not needed for operations would be regraded to the approximate original contour and reclaimed in accordance with landowner wishes. No channel crossings are anticipated, although construction would occur near ephemeral channels. During construction and operation, temporary drainage structures such as ditches, culverts, waterbars, and/or check-dams would be used, as needed, to divert runoff around wind project facilities, but overall drainage patterns would be preserved. As such, impacts to stream channel morphology would be minor for the 40-year life-of-project.

Geologic Hazards. No geologic features that could cause turbine collapse are known to occur in the project area.

Mineral Resources. Because no active mineral extraction operations occur or are likely to occur in the project area, the project would not impact mineral resources.

Paleontology. Direct impacts to fossils could include the inadvertent destruction of scientifically important fossils during excavation. The loss of scientifically important fossils would be an adverse effect. Overall, however, because the project footprint is quite small (about 222 acres) and no significant fossils were discovered during the field reconnaissance, the potential for loss of important fossils is low. Indirect impacts to paleontologic resources could occur from the loss of important fossil materials due to private collection or vandalism of newly exposed areas. Employee education about the value of these resources would minimize any indirect effects. Beneficial impacts could result from the discovery and analysis of fossils during project implementation.

Soils. Approximately 222 acres of soils would be impacted during initial construction and approximately 69 acres would remain under roads, turbines, and facilities for the 40-year life-of-project. Some of the soils are currently cultivated, and are disturbed annually as they are tilled and used for agricultural production. Impacts to soils due to the project would be either minor and temporary or minor and long-term (in project footprint). Impacts would include soil loss through erosion, compaction, and loss of structure in soils that are disturbed or driven on during construction. Less than 20 turbines would be located on soils with high erosion hazard, and all of these would be located on slopes less than 10%. All surface-disturbed or compacted areas not needed for operation would be regraded, loosened, and revegetated in accordance with landowner wishes or easement agreements. Long-term impacts would occur where facilities are installed (e.g., along new roads and at tower sites). Since the overall footprint of the project is small relative to the size of the project area, impacts to soils would be minor.

Impacts of the proposed project on geology, paleontology, and soils would not be significant.

3.2.2.3 Impacts of the No Action Alternative

No impacts to geology or mineral resources would occur under the No Action Alternative. No impacts to the project from geologic hazards would occur. Impacts to paleontology and soils would continue at pre-existing levels due to agricultural activities.

3.2.2.4 Mitigation Measures

No additional mitigation, above and beyond the practices listed in Sections 2.2.10 and 2.2.11, are proposed.

3.3 WATER RESOURCES

3.3.1 Environmental Setting for the Proposed Project

Surface water drains the project area, flowing off of Peetz Table to the north, south, east, and west (Figure 3.7). All of the drainages are ephemeral, flowing only during snowmelt or in response to precipitation. The principal drainage in the project area is Spring Canyon, which drains the eastern three-quarters of the project area. The canyon is highly dissected in Sections 31 and 32, T11N, R50W. Other surface water drainages are generally unnamed and are typically poorly defined swales or have been tilled and no longer exist. Small stock ponds or dugouts/reservoirs developed for livestock watering occur in some of the drainages outside of the project footprint area. Numerous playas (depressions without external drainage) also occur throughout the project area but most of these have been tilled.

Ground water in the project area is contained in the High Plains aquifer, which underlies 174,000 square miles in Colorado, Nebraska, Wyoming, Kansas, Oklahoma, Texas, and New Mexico (Topper et al. 2003). The High Plains aquifer consists of, in ascending order, the Tertiary Brule Formation of the White River Group, the Arikaree Formation, the Ogallala Formation; and Quaternary unconsolidated alluvial deposits, loess, and valley-fill deposits (Topper et al. 2003). Yields range from a low of less than 100 gallons per minute (gpm) in the Brule Formation to 3,100 gpm in the Ogallala aquifer and overlying alluvial deposits. The Ogallala aquifer is an important regional ground water resource, and it and the overlying alluvial deposits are typically unconfined. Recharge occurs primarily through infiltration of precipitation, with some streambed and irrigation water infiltration. Discharge typically exceeds recharge, as ground water is withdrawn for agricultural purposes. In February of 2001, 15,600 completed wells were documented in the High Plains aquifer, and 37 water wells occur in the project area (see Figure 3.7). Wells in the project area range from 250 to 300 ft deep (personal communication, December 2004, with Byron Gillham, CDOW). Between 1980 and 1997, water levels in the project area fluctuated by ±5 ft (Topper et al. 2003). Ground water was not encountered in four 35-ft deep geotechnical exploration holes drilled in March 2005 near the substation location.

3.3.2 Environmental Impacts and Mitigation Measures

3.3.2.1 Significance Criteria

Impacts to water resources would be considered significant if:

- the quantity and quality of discharges from streams are modified by instream construction or accidental contamination (e.g., oil and gasoline spills) to the extent that water use by established users (e.g., private water supplies and irrigation) is measurably reduced;
- surface drainage patterns or stream channel morphology is altered;
- drilling foundations would create hydrologic conduits between aquifers used for water supply;
- water consumption would exceed existing permitted levels or quantities of water required for concrete and dust suppression exceeded available supplies;
- project activities violated the *Clean Water Act*; or
- pesticide use contaminated surface waters.

3.3.2.2 Impacts of Proposed Project

Impacts to surface water are expected to be minimal during construction and operation. Potential impacts to surface water quality include increased turbidity, salinity, and sedimentation of surface waters due to runoff and erosion from disturbed areas. Accidental spills of petroleum products or other pollutants also could impact surface water quality.

All surface-disturbed areas not needed for operations would be restored to the approximate original contour, and pre-existing drainage patterns would be preserved so the quantity and quality of discharges from streams would not be modified. In areas occupied by permanent facilities, surface runoff would be routed around the facility so that drainage patterns would be preserved. Permanent facilities would not be located in stream channels. If stream channels are crossed by access roads, appropriately-sized culverts would be installed to maintain channel flows and protect channel morphology. Surface drainage patterns and stream channel morphology would not be altered.

Depth to bedrock in the project area ranges from 0 to more than 5 ft (Amen et al. 1977), so foundation excavation is likely to encounter bedrock. However, since water well depths in the project area range from 250 to 300 ft, foundation excavation is unlikely to encounter groundwater, and local ground water supplies are not anticipated to be affected.

Water for concrete for foundations and for dust control would come from off-site existing municipal or private sources (see Section 2.2.7), which may derive from surface water, ground water, or a combination of the two. None of these sources would be required to increase water production to meet project needs (personal communication, March 2005, with Mike Logsdon, President, Diamondback Services, Inc.). The project would result in the consumption of an average of 0.2 acre-ft per year of surface and/or ground water but is not expected to infringe on existing water rights or to cause undue depletion of these sources. Impacts to water resources due to the proposed project would not be significant.

Pesticide/herbicide use is not anticipated, so no impacts to surface waters from pesticide use would occur.

The project would be in compliance with the *Clean Water Act*.

3.3.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, no impacts to surface or ground water would occur due to the project.

3.3.2.4 Mitigation Measures

In addition to Western's standard practices, a SWPPP would be developed as required by the EPA and would be implemented during construction to provide measures to minimize and prevent impacts to water resources. Erosion control measures including diversions, riprap, matting, sediment traps, and timely revegetation of all surface-disturbed areas would minimize runoff-related sedimentation impacts. Culverts would be equipped with erosion-control structures such as catch basins, ditches, or rock aprons, and these structures would be cleaned and maintained for the life-of-project. Erosion-prone areas (e.g., dissected land, badlands, and slopes ≥15-20%) would be avoided, where feasible. To reduce the potential for contamination of water due to inadvertent spills, SCE would prepare and implement a SPCCP as required by EPA. If needed, pesticide/herbicide use would be limited to non-persistent, immobile pesticides/herbicide and applied in accordance with manufacture directions.

3.4 FLOODPLAINS AND WETLANDS

3.4.1 Environmental Setting for the Proposed Project

One-hundred year floodplains occur along Spring Canyon, Cottonwood Creek (north of Spring Creek), and Cow Creek (northeast of Peetz) (see Figure 3.7) (Federal Emergency Management Agency [FEMA] 2004). The Cow Creek floodplain is currently under pivot irrigation and there is no surface expression of Cottonwood Creek in the project area (personal communication, December 2004, with Brent Orr, attorney for SCE), so the floodplains on these two creeks no longer exist.

No wetlands occur in the 2,000-ft or 50-ft wide project footprint areas. According to National Wetland Inventory (NWI) maps for the Peetz and Haystack Butte 7.5' Quadrangles, wetlands may occur within the overall project area (see Figure 3.7). Most are apparently playas and are classified on NWI maps as palustrine (non-riverine)-farmed. On-site field reconnaissance indicated that most, if not all, of these playas have been farmed. Other potential palustrine wetlands are scattered across Peetz Table. Spring Canyon is classified as a riverine wetland, but no wetland vegetation is known to occur in Spring Canyon in the vicinity of the project area.

3.4.2 Environmental Impacts and Mitigation Measures

3.4.2.1 Significance Criteria

Impacts to floodplains and wetlands would be considered significant:

- if facilities were constructed in a floodplain and caused an increase in the potential for flooding or violated any floodplain protection standards;
- if a flood event would cause damage to wind project facilities; or
- if construction resulted in long-term loss of wetlands or wetland vegetation.

3.4.2.2 Impacts of the Proposed Project

Since no floodplains or wetlands occur within the project footprint (i.e., the 2,000-ft and 50-ft wide survey corridors shown on Figure 2.1), these resources would not be impacted by the project. SCE would use best management practices to prevent sedimentation in downstream floodplains.

3.4.2.3 Impacts of the No Action Alternative

No impacts to floodplains or wetlands would occur under the No Action Alternative.

3.4.2.4 Mitigation Measures

No additional mitigation is proposed.

3.5 VEGETATION

3.5.1 Environmental Setting for the Proposed Project

Project area vegetation is a mosaic of farmland (12,660 acres or 57% of the project area), Conservation Reserve Program (CRP) land (2,300 acres [10%]), native prairie (7,094 acres [32%]), and shelterbelts (scattered throughout the project area) (Figure 3.8). Principal crops are winter wheat and millet. Some areas are interseeded and used for hay and/or pasture for livestock. CRP land typically contains a mixture of tall and short grasses and may be grazed by livestock or returned to crop production when the CRP contract expires, unless the CRP is extended and these areas are re-enrolled. Native vegetation is typical of shortgrass prairie, with species such as blue grama, buffalograss, western wheatgrass, little bluestem, switchgrass, prairie sandreed, sand dropseed, and sedges common (Appendix A). Shrubs typically include big sagebrush, rabbitbrush, Rocky Mountain juniper, eastern red cedar, yellow current chokecherry, squawbush, wild current, and wild plum. Many farmsteads and abandoned farm sites have an adjacent shelterbelt of trees and shrubs. Most of the shelterbelts on abandoned farmsteads contain decadent/senescent trees.

3.5.2 Environmental Impacts and Mitigation Measures

3.5.2.1 Significance Criteria

Impacts to vegetation would be considered significant:

- if construction results in the long-term loss of riparian vegetation or
- if construction or operation results in the invasion of non-native weedy species.

3.5.2.2 Impacts of the Proposed Project

Direct impacts to vegetation would include surface disturbance of 222 acres during construction (see Table 2.1)--84 acres of native prairie, 102 acres of cropland, and 36 acres of CRP land.

Most of the disturbed area would be reclaimed and revegetated, with 69 acres remaining occupied by roads, turbine foundations, and facilities for the life-of-project (26 acres of native prairie, 32 acres of cropland, and 11 acres of CRP land). Since the project footprint would be relatively small compared with the overall size of the project area and much of the area is tilled annually for agricultural production, these direct impacts would be minimal. The project would not impact any riparian vegetation because no riparian vegetation occurs within the project footprint. Weed infestations could constitute an adverse effect, but SCE would take measures (e.g., washing construction vehicles before going on-site, avoiding weedy areas once on-site, and controlling weeds in accordance with landowner wishes or easement agreements) so that impacts from weeds are anticipated to be minimal. No tree removal is anticipated--if tree removal becomes necessary, it would be limited to those trees that impede safe and efficient project operation. Any surface-disturbed areas that are not required for operations would be revegetated pursuant to easement agreements with landowners as soon as possible after construction. Impacts to vegetation due to the proposed project would not be significant.

3.5.2.3 Impacts of the No Action Alternative

No impacts to vegetation would occur under the No Action Alternative.

3.5.2.4 Mitigation Measures

In addition to Western's standard practices, surface-disturbed areas not needed for the operation of the project would be reclaimed as soon as practical. SCE would limit the spread of weeds by washing equipment before bringing it on-site, and if weeds spread due to the project, SCE would implement a weed control program in conjunction with the landowners and lease agreements.

3.6 WILDLIFE

3.6.1 Environmental Setting of the Proposed Project

The project area provides habitat for a variety of wildlife species typical of agricultural lands and native shortgrass prairie in northeastern Colorado. Pronghorn antelope and mule deer from Game Management Unit (GMU) 90 and a small portion of GMU 89 are big game species that occur in the area. GMU 90 covers most of the northeastern quarter of Logan County and a small portion of northwestern Sedgewick County. The project area contains overall range for pronghorn, and the very southern portions of the project area are within a pronghorn concentration area. An estimated 200-250 pronghorn presently occupy GMU 90 (personal communication, October 2004, with Marty Stratman, CDOW). The entire project area is mule deer overall range, and about 200 mule deer occupy GMU 90. No crucial winter ranges for pronghorn or mule deer occur in the project area. White-tailed deer overall range occurs south of the project area, so white-tailed deer are not likely to occur on-site.

Predator species that are likely to occur in the project area include coyote, red fox, swift fox, raccoon, long-tailed weasel, mink, American badger, eastern spotted skunk, striped skunk, and, possibly, bobcat and mountain lion (CDOW unpublished data) (Appendix B).

A number of small mammals may occur in the project area. Lagomorph species likely to occur in the project area include desert cottontail, eastern cottontail, black-tailed jackrabbit, and white-tailed jackrabbit (CDOW unpublished data) (Appendix B). Spotted ground squirrel, thirteen-lined ground squirrel, black-tailed prairie dog, fox squirrel, northern pocket gopher, plains pocket gopher, plains pocket mouse, silky pocket mouse, hispid pocket mouse, Ord's kangaroo rat, western harvest mouse, plains harvest mouse, deer mouse, northern grasshopper mouse, bushy-tailed woodrat, prairie vole, meadow vole, Norway rat, and porcupine are rodent species that could occur in the project area. Black-tailed prairie dogs were observed in the project area during project-related fieldwork. Other mammals that could occur in the project area include Virginia opossum, least shrew, eastern mole, and six bat species.

No bat roosts are known to occur in the area; however, historically bats roosted in a tree about 2 mi north of the project area (personal communication, October 2004, with Byron Gillham, CDOW). Roosting habitat includes the trees, elevators, and other structures (e.g., barns) in the project area. Big brown bat, little brown myotis, hoary bat, red bat, silver-haired bat, and western small-footed myotis are bat species that are known to occur or likely to occur in Logan County (CDOW unpublished data) (see Appendix B).

A variety of reptiles and amphibians (herptiles) may occur in the project area, including leopard frog, tiger salamander, wandering garter snake, and gopher snake (CDOW unpublished data) (see Appendix B).

An estimated 266 species of birds occur in Logan County and may occur in the project area (CDOW unpublished data) (see Appendix B)--most species probably occur in the project area only during migration and thus would be occasional visitors only. Many of the species (i.e., waterfowl, shorebirds, waders) listed in Appendix B would not breed in the project area because no breeding habitat exists, but they may occasionally visit the project area if they are breeding and nesting in nearby habitat or feeding in agricultural fields during migration. The project area contains breeding and nesting habitat for several species of raptors, including Swainson's hawk, red-tailed hawk, ferruginous hawk, golden eagle, northern harrier, prairie falcon, American kestrel, Cooper’s hawk, sharp-shinned hawk, great-horned owl, barn owl, short-eared owl, eastern screech owl, and burrowing owl. An initial field survey for raptor nests was completed in October 2004; 24 raptor nests are known to occur in the project area's shelterbelts and on the small rimrock outcrops in Spring Canyon (see Figure 2.1). Raptor species observed during project-related fieldwork to date include golden eagle, prairie falcon, American kestrel, merlin, sharp-shinned hawk, northern harrier, red-tailed hawk, ferruginous hawk, rough-legged hawk, short-eared owl, great-horned owl, and barn owl. A raptor nest inventory would be conducted during the 2005 breeding season to identify active nests so that appropriate buffer zones can be placed until the young have fledged.

Snipe, thrashers, thrushes, shrikes, pheasant, grouse, vireos, warblers, wrens, grosbeaks, buntings, towhees, sparrows, and blackbirds also likely breed and nest in the project area. Pheasants were observed in the project area during project-related fieldwork. Sharp-tailed grouse may occur on-site, but there are no known leks in the area (personal communication, October 2004, with Larry Crooks, CDOW). Lesser prairie chicken are not known to occur in the area. Mourning doves are common.

There are no fisheries in the area due to lack of suitable streams or lakes/reservoirs to support fish populations.

3.6.2 Environmental Impacts and Mitigation Measures

3.6.2.1 Significance Criteria

Impacts to wildlife resources would be considered significant:

- if construction activities occur on established leks or breeding grounds of upland game birds during the nesting season;
- if critical big game winter range is affected by construction during critical winter periods, causing disturbance or displacement of wintering animals;
- if an active raptor nest is disturbed; or
- if mortality of birds and/or bats from collisions with wind turbines reduced local populations of the affected species to the point where they would be considered for listing as endangered or threatened.

3.6.2.2 Impacts of the Proposed Project

Impacts to big game are expected to be minimal because the land is primarily agricultural and is subject to regular human activity from farming and ranching activities. Impacts to big game could include direct mortality due to collisions with vehicles, loss of foraging habitat, and displacement from portions of the project area during construction due to human presence or noise. Mortalities due to collisions should be minimal. Since the overall footprint of the project would be small relative to the size of the project area, loss of forage would be negligible. Forage distribution has already been substantially altered by agricultural activities, where crops provide abundant forage and fallow areas do not, and the footprint of the wind project likely would be unnoticeable within this larger agricultural management system. Any big game using the area likely would habituate to the turbines and operation activities. No detectable changes in pronghorn antelope abundance occurred at the Arlington, Wyoming, wind project after construction (Johnson et al. 2000), so pronghorn may habituate to wind development. Mule deer also are fairly tolerant of human activities (Reed 1981; Irby et al. 1988), and there is already frequent human presence due to farming and ranching activities, so it is likely that any displacement would likely be temporary and displacement effects would be minimal. No crucial winter range or known birthing areas occur on-site, so big game critical habitats would not be affected.

Bats may be impacted due to collision-related mortality. Other wind projects are known to cause substantial bat mortality (FWS 2003), the causes of which are being investigated (Energetics, Inc. 2004). Since bats are not known to roost in the area and none of the six species that may occur in the area are Federal- or state-listed TEP&C species, impacts to bats are expected to not be significant. Bats may migrate through the project area and thus may be at risk, but the species known to occur in Logan County are common. Impacts to other mammals and herptiles are also expected to be minimal. Mammals are relatively mobile, herptiles are a little less so, and, while mortality due to collisions with vehicles or during excavation is possible, these occurrences are anticipated to be infrequent. As with big game, the overall agricultural management system within the project area already strongly influences forage/prey availability, so the short-term 222 acres of loss of habitat (69 acres over the life-of-project) from the project footprint would probably have a minimal effect on other mammals and reptiles.

Birds may be directly impacted due to collisions with turbines, meteorological towers, overhead power lines, and substation structures; and through habitat loss due to vegetation disturbance, human presence, and noise. The potential impacts of wind power development on birds is well-documented, but wind power-related mortality is low compared with other sources of bird mortality (Table 3.2) (National Wind Coordinating Committee [NWCC] 2001).

There are no data regarding avian mortality at the existing wind project west of Peetz (personal communication, January 2005, with Stephanie Jones, FWS). The FWS has developed a set of recommendations to avoid and minimize impacts to wildlife from wind turbines (FWS 2003). These recommendations and a discussion of project adherence to these recommendations are presented in Table 3.3.

Impacts to wildlife due to the proposed project would not be significant.

3.6.2.3 Impacts of the No Action Alternative

No impacts to wildlife would occur under the No Action Alternative.

3.6.2.4 Mitigation Measures

To minimize impacts to wildlife, SCE would implement the following mitigation measures practices:

- conduct a raptor nest search during the 2005 nesting season, and time construction to avoid activities within an appropriate buffer zone of any active nests (see Section 2.2.11.9) during the stipulated period or until after the young have fledged;

Table 3.2 Estimated Annual Avian Collision Mortality in the U.S.[1]

Source of Mortality	Estimated No. of Mortalities (millions)
Vehicles	60 - 80
Buildings and windows	98 - 980
Power lines	0.01 - 174
Communication towers	4 - 50
Wind generation facilities	0.01 - 0.04

[1] Source: NWCC (2001).

Table 3.3 Site Development and Turbine Design and Operation Recommendations.

FWS Interim Guidance	Existing Conditions and Proposed Action
Site Development	
1. Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal *Endangered Species Act* (ESA).	No documented locations of any species of wildlife, fish, or plants protected under the ESA occur in the project area. While both federal- and state-listed TEP&C species may occur in the project area, impacts are expected to be minimal.
2. Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low (e.g., birds present rarely enter the rotor-swept area). Examples of high concentration areas for birds are wetlands, State or Federal refuges, private duck clubs, staging areas, rookeries, leks, roosts, riparian areas along streams, and landfills. Avoid known daily movement flyways (e.g., between roosting and feeding areas) and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility.	There are no known local bird migration pathways in the project area. There are no known high concentration areas such as wetlands, etc. in the project area. Daily movements may occur among the project area's shelterbelts, agricultural fields, and prairie habitats, but these are common features of the landscape, and thus the project is not located in an area where daily movements would pose more risk than other sites. SEC has avoided placing turbines between Spring Canyon and an active prairie dog colony. The project area does not have a high incidence of fog, mist, or other conditions of low visibility.
3. Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas.	There are no known bat colonies in the project area. It is not known if migration corridors or flight paths occur in the project area.
4. Configure turbine locations to avoid areas or features of the landscapes known to attract raptors (hawks, falcons, eagles, owls). For example, golden eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include not locating turbines in a dip or pass in a ridge, or in or near prairie dog colonies.	Turbines have been located on relatively flat lands, away from dips, saddles, and shelterbelts (i.e., potential raptor nesting sites). No turbines or other project facilities would be placed in prairie dog colonies.
5. Configure turbine arrays to avoid potential avian mortality where feasible. For example, group turbines rather than spreading them widely, and orient rows of turbines parallel to known bird movements, thereby decreasing the potential for bird strikes. Implement appropriate storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species (e.g., greater sage-grouse).	SEC has configured the project to group turbines as closely as possible without losing energy generating capacity due to wake effects among turbines. Widely spacing turbines increases overall project costs due to the need for more power lines and more roads, so, from a cost perspective, the project is designed with the closest spacing possible. SEC will implement a storm water pollution prevention plan. The project will result in habitat fragmentation for shortgrass prairie species; however, the area is already highly fragmented by existing agricultural activities.
6. Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on lands already altered or cultivated and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas.	About 46% of the project's facilities will be placed on land that is currently tilled; 38% will be located in native shortgrass prairie. The shortgrass prairie is highly fragmented by existing roads, residences, transmission lines, etc.
7. Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds).	According to CDOW, no prairie grouse are known to occur in the project area (personal communication, October 2004, with Larry Crooks, CDOW).
8. Minimize roads, fences, and other infrastructure. All infrastructure should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats.	The only facility that will be fenced is the project substation and O&M building, where fencing is required for public health and safety reasons and the protect SCE's property. SEC is using existing roads for much of its access; it will construct about 26.0 mi of new roads. The number of roads, fences, and other infrastructures are minimized to minimize project development and operation costs.

Table 3.3 (Continued)

FWS Interim Guidance	Existing Conditions and Proposed Action
9. Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors.	All disturbed areas in native prairie will be reclaimed with native, adapted species. SEC will control weeds.
Turbine Design and Operation	
1. Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities. Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting. Avoid use of guy wires for turbine or meteorological tower supports. All existing guy wires should be marked with recommended bird deterrent devices (APLIC 1994).	SEC will use tubular towers and perch-free nacelles.
2. If taller turbines (top of the rotor-swept area is >199 feet above ground level) require lights for aviation safety, the minimum amount of pilot warning and obstruction avoidance lighting specified by FAA should be used (FAA 2000). Unless otherwise requested by the FAA, only white strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. Solid red or pulsating red incandescent lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights.	This recommendation has been revised since its initial publication. SEC is preparing a plan to meet FAA requirements while minimizing the number of lights for the project.
3. Where the height of the rotor-swept area produces a high risk for wildlife, adjust tower height where feasible to reduce the risk of strikes.	The height of the rotor-swept area for the Spring Canyon wind project is not known to pose a high risk to wildlife.
4. Where feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds. Use recommendations of the APLIC (1994, 1996) for any required above-ground lines, transformers, or conductors.	All in-field collection and communications lines will be installed underground. Only about 1.0 mi of overhead power collection lines will be constructed, and these will be constructed in accordance with APLIC recommendations.
5. High seasonal concentrations of birds may cause problems in some areas. If, however, power generation is critical in these areas, an average of 3 years monitoring data (e.g., acoustic, radar, infrared, or observational) should be collected and used to determine peak use dates for specific sites. Where feasible, turbines should be shut down during periods when birds are highly concentrated at those sites.	No seasonal high concentrations of birds are known to occur in the project area.
6. When upgrading or retrofitting turbines, follow the above guidelines as closely as possible. If studies indicate high mortality at specific older turbines, retrofitting or relocating is highly recommended.	Not applicable.

- avoid placing turbines or other facilities in active prairie dog colonies;
- design the project to comply with FWS guidelines to the extent practical;
- use state-of-the-art turbines and wind industry standard practices;
- minimize noise;
- prohibit hunting, dogs, and possession of firearms by employees;
- set and enforce speed limits;
- limit traffic to designated roads;
- minimize disturbance;
- promptly reclaim disturbed areas, including restoration of shortgrass prairie;
- minimize erosion and promptly clean up spills.

3.7 SPECIAL STATUS AND SENSITIVE SPECIES

3.7.1 Environmental Setting for the Proposed Project

A list of endangered, threatened, proposed, and candidate species was obtained from FWS on November 22, 2004 (Table 3.4 and Appendix C). A list of state-listed TEP&C species was obtained from the CDOW website (Appendix D) and the Colorado Natural Heritage Program (CNHP) (Table 3.5). Additional information concerning sensitive species in the project area was obtained from the CNHP (Appendix E). The biological assessment is in Appendix F.

Fieldwork was conducted from February 2-9, 2005, after the turbine locations and proposed access road locations had been staked by SEC, and included surveys for habitat and any species within 1,000 ft on either side of each turbine string and proposed new access roads (Figure 2.1). Therefore, a 2,000-ft wide corridor around all areas to be disturbed was surveyed. In addition, the proposed substation and operation and maintenance building location, including a 200-ft buffer around the substation and operation and maintenance building, was surveyed. The 50-ft wide collection system corridors and crane paths were surveyed on March 31 and April 1. Of the entire 22,054-acre project area, 6,424 acres surveyed.

Table 3.4 Federally Listed Species That May Occur in Logan County, Colorado.[1]

Species	Habitat	Potential to Occur in Project Area or to be affected by the Project
Interior least tern[2]	Nest in riverine areas with sparsely vegetated sand and gravel bars within wide, unobstructed river channels or salt flat along lake shorelines	No suitable nesting habitat in project area; known to occur in Logan County; possible flyovers during migration
Piping plover[2]	Wide, sparsely vegetated sand or gravel beaches adjacent to vast alkali lakes; washed-out hillside beaches on smaller, semi-permanent alkali wetlands; beaches, sand flats, and floodplains; forage near water	No suitable nesting habitat in project area; known to occur in Logan County; possible flyovers during migration
Bald eagle	Breeding habitat includes rivers, lakes, and reservoirs with forested shorelines of cliffs; winter roosting areas include large trees in sheltered areas near open water	No suitable breeding or winter roost areas occur in the project area; suitable foraging habitat present; flyovers likely
Whooping crane[2]	Breeding and nesting occurs in Wood Buffalo National Park, Alberta and Northwest Territories, Canada; they winter in Aransas National Park, Texas; whooping cranes use a variety of habitats during migration including cropland, wetlands, and riverine habitat	No nesting habitat occurs in the project area; known to occur in Logan County; possible flyovers and stopovers in cropland during migration
Pallid sturgeon[2]	Bottoms of large, turbid, relatively warm free-flowing rivers	Pallid sturgeon occur in the South Platte River, downstream from the project area

1 Source: Letter from Susan Linner, U.S. Fish and Wildlife Service, to Karyn Coppinger, TRC Mariah Associates Inc., November 22, 2004 (see Appendix C). See appendices for detailed species accounts.

2 Water depletions in the South Platte River may affect the species and/or critical habitat in downstream reaches in other states.

Table 3.5 State-listed TEP&C Species Likely to Occur in the Project Area.[1]

Species	Habitat	Potential to Occur in the Project Area
Birds		
Burrowing owl	Plains and basins, often associated with prairie dog colonies	Potential breeding, nesting, and foraging habitat in black-tailed prairie dog colonies
Ferruginous hawk	Open grasslands and shrublands	Potential breeding, nesting and foraging habitat; observed on-site
Long-billed curlew	Meadows, pastures, shoreline, and marshes	Potential resident
Mountain plover	Sparse shortgrass or mixed grass prairie; also in short sagebrush plains; often associated with prairie dog colonies	Potential breeding, nesting, and foraging habitat
Peregrine falcon	Mountainous zones or cliffs near large lakes and rivers	Potential to fly over site during migration; no nesting habitat
Sandhill crane	Mud flats around reservoirs, moist meadows, and agricultural areas, parks with grassy hummocks and watercourses, beaver ponds, and natural ponds lined with willow or aspen, wetlands and shallow marshes	Potential to fly over site during migration; no potential breeding, nesting, and minimal foraging/resting habitat
Mammals		
Black-tailed prairie dog	Shortgrass prairie, usually with loose, sandy soils; can form large, dense colonies	Occurs on-site
Northern pocket gopher	Meadows and along streams	Potential resident
Swift fox	Shortgrass prairie, but can be found in sagebrush-grasslands; they are found particularly in sparsely vegetated areas such as prairie dog colonies	Potential rare visitor

1 Only those species that are likely to occur in the project area, based on habitat presence--or in the case of black-tailed prairie dogs, ferruginous hawks, burrowing owls, and long-billed curlew that have been observed on-site--are included in this table.

In addition to TEP&C species habitat mapping, a preliminary raptor nest inventory was conducted on October 27, 2004, and on March 28 and 29, 2005, to determine if bald eagle nesting habitat or nests occurred in the project area. All potential raptor nesting habitat was searched for nests using the naked eye, binoculars, or a spotting scope. All nest locations (regardless of species) were mapped on a 7.5' topographic map, photographs were taken, and a raptor nest inventory data sheet was completed.

On January 29, 2005, Karyn Coppinger (TRC Mariah) was on-site conducting other business and observed a bald eagle perched on the ground in a cropped field.

Habitats for TEP&C species were identified based on current habitat descriptions provided by the FWS. Lists of wildlife species known to occur or that may occur in Logan County were obtained from the CDOW (CDOW n.d.). All suitable TEP&C habitats were mapped using a global positioning system (GPS) either from an all-terrain vehicle or on foot. The GPS data were downloaded into an ArcView geographic information system (GIS) database for the project area, and maps were created.

No Federal TEP&C plant species are expected to occur in Logan County, and the State of Colorado has no listed plant species or communities (CNHP 2004). TEP&C plant species are not discussed further in this EA.

3.7.1.1 Bald Eagle

No bald eagle nesting habitat occurs in the project area. Bald eagles are known to be winter visitors in the region, and the dead trees in shelterbelts scattered throughout the area may provide perching habitat. Although the area is over 20 mi from perennial water with preferred bald eagle feeding areas including fisheries and waterfowl concentration areas (e.g., the South Platte River, Sterling Reservoir, and Jumbo Reservoir), bald eagles can easily cover this distance while foraging and thus may forage on the project area at any time of year. A bald eagle was observed in the project area perched on the ground in a farmed field in January 2005. The CDOW does not have raptor nest records for this area (personal communication, October 2004, with Byron

Gillham, CDOW), so it is not known if bald eagles nest in the general vicinity, but the lack of preferred nesting habitat suggests that bald eagle nesting is unlikely. None of the nests observed in the project area during fall 2004 or spring of 2005 appear to be bald eagle nests.

3.7.1.2 Other Federally Listed Species

No habitat for pallid sturgeon, whooping crane, interior least tern, or piping plover occurs in the project area, but these species are of concern in Logan County because water depletions in the South Platte River may affect the species and/or critical habitat downstream. Pallid sturgeon does not occur in the project area. Whooping crane, interior least tern, and piping plover are known to occur in Logan County (CDOW unpublished data) (Appendix B), where the Platte River is a primary migratory corridor. There is one recorded whooping crane observation (1979) for Cheyenne County, Nebraska (personal communication, January 2005, Rick Schneider, Nebraska Game and Parks Commission). However, during migration between breeding and wintering areas, whooping crane, interior least tern, and piping plover may migrate through the project area; and thus would be infrequent visitors, mostly in spring and fall.

3.7.1.3 State-listed Species

The project area's shortgrass prairie, CRP lands, and/or agricultural fields (Figure 3.9) provide suitable habitat for burrowing owl, ferruginous hawk, long-billed curlew, mountain plover, peregrine falcon, sandhill crane, black-tailed prairie dog, northern pocket gopher, and swift fox. Within the survey area, 2,445 acres are shortgrass prairie, 2,967 acres are cultivated fields, and 1,012 acres are CRP lands.

Two black-tailed prairie dog colonies (42 acres) occur within the 2,000-ft and 50-ft survey corridors and other prairie dog colonies occur within the project area but outside of the survey corridor. Prairie dog colony locations are highly variable because of prairie dog control practices used by landowners; some colonies observed in the fall of 2004 are currently inactive. The 42 acres of colonies provide nesting habitat for burrowing owls, which may be summer residents or may migrate through the area during spring and fall. Burrowing owls were observed in the project area during fieldwork.

Ferruginous hawk are known to occur in the project area. There are 24 known raptor nests within the project area, and the ferruginous hawks likely nest in the general vicinity. Ferruginous hawks were observed on-site in March 2005, but it is not currently known if ferruginous hawks nest within the project area and a 1.0-mi buffer. Ferruginous hawks also forage in and migrate through the project area; therefore, ferruginous hawks occur in the project area during spring, summer, and fall.

Long-billed curlews may nest and forage in the project area's shortgrass prairie and may also migrate through the project area. They were observed on-site during fieldwork, and they may be present in the area during spring, summer, and fall.

Approximately 342 acres of suitable mountain plover habitat occur within the 2,000-ft and 50-ft survey corridors. Portions of the project area's shortgrass prairie and the black-tailed prairie dog colonies provide suitable nesting habitat. In addition, fallow agricultural fields or those planted later in the season (i.e., with low vegetation at the start of the breeding season) may be suitable mountain plover nesting habitat (although nests would be abandoned in cases where crops grow too tall after nesting is initiated); therefore, an additional 2,967 acres within the 2,000-ft and 50-ft survey corridors may be mountain plover habitat, depending on land management practices. Mountain plover may also migrate through the project area. Therefore, they may occur in the area during spring, summer, and fall. Mountain plover have been documented in Cheyenne County, Nebraska, immediately north of the project area (personal communication, January 2005, Rick Schneider, Nebraska Game and Parks Commission).

Peregrine falcons may forage in and migrate through the project area, but no nesting habitat occurs in or immediately adjacent to the area. Peregrine falcons are likely rare visitors to the area.

Sandhill cranes may migrate through the project area, but no breeding or nesting habitat occurs in the area. During migration, sandhill cranes may stopover to feed in the project area's agricultural fields. Sandhill cranes, therefore, may occur in the project area during spring and fall migration.

Two black-tailed prairie dog colonies occur (42 acres) within the 2,000-ft and 50-ft survey corridors. Other colonies occur in the project area but not within the survey corridors. Black-tailed prairie dogs are year-round residents in the project area.

Northern pocket gophers may occur in the project area's shortgrass prairie and CRP lands (see Figure 3.8) and may be year-round residents.

Swift fox may occur in any of the project area's habitats and may den in the project area's shortgrass prairie (see Figure 3.8), although no dens are known to occur in the 2,000-ft or 50-ft survey corridors. The CDOW has not been sampling in the project area proper, but no swift fox have been captured on CDOW transects in northeastern Colorado, so there does not appear to be a high concentration of swift fox in northern Logan County (personal communication, February 2005, with Kirstie Bay, CDOW). Swift fox are likely rare visitors to the project area.

3.7.2 Environmental Impacts and Mitigation Measures

3.7.2.1 Significance Criteria

Impacts to special status and sensitive species would be considered significant if effects from the Proposed Project such as loss of individuals or loss of critical habitat result in a "jeopardy" Biological Opinion under Section 7 of the ESA or similar loss of state listed species.

3.7.2.2 Bald Eagles

Impacts to bald eagles could include direct mortality due to collisions with turbines and overhead power lines. In the wind power literature (e.g., National Wind Coordinating Committee 2001), collisions with wind turbines are rare events, and, if eagles only infrequently visit the area, potential for collision-related mortality is low. SCE would use state-of-the-art turbine technology, including large unguyed turbines with tubular towers, slow-moving rotors, and few perches, thus reducing the potential for bird collisions. The 1.0 mi of overhead power lines would be designed per the *Suggested Practices for Raptor Protection on Power Lines--the State of the Art in 1996* (Avian Power Line Interaction Committee 1996) to avoid potential electrocution impacts. Bald eagles feed on carrion, among other things, and thus are at risk of collision with vehicles when they feed on road-killed animals, but again, there is low potential for this impact. Eagles may be attracted to the area if construction increases the number of road kills; a recommended mitigation is to set and enforce speed traffic speed limits and to keep carrion off roads.

No indirect effects, such as displacement from preferred habitat or loss of prey base are anticipated because the project area does not contain preferred habitat and eagles are likely only rare visitors to the area.

The project may affect, but is not likely to adversely affect, bald eagles.

3.7.2.3 Other Federally Listed Species

Direct impacts to whooping crane, interior least tern, and piping plover due to collisions with turbines and the 1.0 mi of power lines would be similar to those described for bald eagle (e.g., potential for collision-related mortality is low).

Indirect impacts could occur if the project resulted in water depletions in the South Platte River. On average, the project would use an estimated 0.2 acre-ft per year (see Table 2.4).

In 2002, the FWS prepared a biological opinion in its *Revised Intra-Service Section 7 Consultation for Federal Agency Actions Resulting in Minor Water Depletions to the Platte River System* (FWS 2002). The biological opinion covers any Federal actions other than wetland restoration projects that result in average annual depletions of 25 acre-ft or less to the Platte

River system, regardless of location within the basin. The effects analysis and conservation measures apply only to Federally listed species, designated whooping crane habitat, and proposed critical habitat for the piping plover along the Platte River in Nebraska.

In accordance with the above-referenced biological opinion, "Federal agencies should continue to conclude that each action resulting in a depletion of 25 acre-feet or less per year to the Platte River system may adversely affect the whooping crane, interior least tern, piping plover, and/or pallid sturgeon, designated whooping crane critical habitat, and proposed piping plover critical habitat" (FWS 2002). No mitigation is required because the U.S. Forest Service and the FWS have provided funds to the Fish and Wildlife Foundation account for the purposes of offsetting the adverse effects of Federal agency actions resulting in minor water depletions, such as the Spring Canyon Wind Energy Project.

3.7.2.4 State-listed Species

SCE has designed the project to avoid the area's black-tailed prairie dog colonies, so burrowing owl nests would not be impacted. Nesting burrowing owls may be displaced from portions of this colony by construction noise and human activity in areas adjacent to the colony during construction. Prior to construction, the two prairie dog colonies within the survey corridors would be searched for burrowing owls and their sign, and if owls occur in the colony, construction may be delayed within 0.5 mi of the colony until after the nesting season (early August). During operation, impacts to burrowing owls could include mortality due to collisions with vehicles or wind turbines. Since burrowing owls are mobile, collisions with vehicles are unlikely, and since SCE will use state-of-the-art turbines with tubular towers and slow-turning rotors, mortalities during and after construction are anticipated to be rare events. Project impacts to burrowing owls are expected to be low.

Construction-related impacts to ferruginous hawks could include nest abandonment and the resultant loss of eggs or chicks if an active nest occurs on or near the project area. SCE would conduct a raptor nest survey prior to construction, and any active nests would be avoided by an appropriate buffer until the chicks have fledged or the nest fails. Ferruginous hawks may be displaced from the project area due to construction noise and human activity but are expected to resume the use of project area habitat after construction is complete. Operational impacts would include the potential for mortality due to collisions with turbines, but with the use of modern turbines, mortalities are expected to be rare events. Impacts to ferruginous hawks are expected to be low. Post-construction monitoring would be conducted (see Section 2.2.11.9) in part to determine if ferruginous hawk mortality is occurring, and additional mitigation may be required if unacceptable levels of mortality occur, as determined by Western.

Impacts to long-billed curlew during construction could include nest abandonment due to noise and human activity, nest destruction by vehicles or during excavation, and mortality of individuals due to collisions with vehicles. Since much of the project area is tilled annually and only a small acreage of untilled ground would be disturbed, the potential to impact long-billed curlew nests is low. Since long-billed curlews are mobile, potential for collisions with vehicles is also low. Operational impacts could include mortality due to collisions with turbines and overhead lines, but, as described for ferruginous hawks above, mortalities are expected to be rare events. Impacts to long-billed curlew are expected to be low.

Impacts to mountain plover during construction could include direct mortality due to collisions with vehicles, inadvertent nest destruction, and displacement from habitat due to noise and human activity. SCE would conduct mountain plover surveys in all potential habitat prior to construction, and, if nests are found, SCE would avoid construction within 0.25 mi of a nest until the chicks are mobile (about 35 days after the nest is discovered or 7 days post-hatching) unless otherwise approved by Western. Impacts during operation could include direct mortality due to collisions with vehicles and overhead lines and inadvertent nest destruction, particularly if mountain plover elect to nest on turbine pads or along access roads and ROWs, which they tend to do. Employees would be instructed on how to identify mountain plover and to avoid driving in areas where plover are seen until the area has been inspected for nests by a qualified biologist. Operational impacts could also include mountain plover collisions with turbines. However, because mountain plover tend not to fly and typically fly close to the ground when they do fly (U.S. Bureau of Land Management 1995), and because only 1.0 mi of overhead power lines would be built, collision-related mortalities should be minimal. During courtship, mountain plover fly to heights of about 15 to 30 ft, hold their wings in a deep "V" position, and float slowly to the ground; even during this display, mountain plovers would be well below the lowest reaches of the rotors (135 ft). Impacts to mountain plover are expected to be negligible.

Peregrine falcon may be rare visitors to the project area, so both construction and operation impacts are expected to be minimal.

Sandhill cranes may migrate through the project area and may stop to feed in agricultural fields in the project area. Impacts during construction would include displacement from potential resting and feeding areas, but this impact is expected to be minimal because there are abundant agricultural fields throughout the region that could provide these functions. Impacts during operation could include sandhill crane mortality due to collisions with turbines and overhead lines. Sandhill cranes typically migrate at heights well above 400 ft (Toepler and Crete 1978) and thus would only be affected if taking off or landing on or near the site during resting/feeding stopovers or if they are forced down during bad weather. With the use of modern turbines, the potential for mortality is expected to be low. SCE currently is conducting a spring migration study to evaluate sandhill crane use of the project area and may implement additional operational practices, if needed, to minimize potential for sandhill crane mortality.

SCE has designed the project to avoid any surface disturbance in black-tailed prairie dog colonies, so black-tailed prairie dogs would not be impacted by the project with the exception of the potential for vehicle-related mortality.

Construction impacts to northern pocket gopher could include mortality due to collisions with vehicles and inadvertent destruction of burrows during excavation. Because pocket gophers rarely venture aboveground (Clark and Stromberg 1987), mortality due to collisions is unlikely. Since much of the project area is tilled annually and since the project footprint in untilled land would be small, the potential for destruction of burrows is low. During operation, some habitat would be lost for the life-of-project; there would also be potential for collisions with vehicles for the life-of-project.

Swift fox are probably rare visitors to the project area, and thus potential for impacts to this species is low.

3.7.2.5 Impacts of the No Action Alternative

Under the No Action Alternative, no federal- or state-listed species would be impacted by the project.

3.7.2.6 Mitigation Measures

SCE would use state-of-the-art turbine technology, including large unguyed turbines with tubular towers, slow-moving rotors, and perching surfaces, thus reducing the potential for bird collisions. The power lines would be designed per the *Suggested Practices for Raptor Protection on Power Lines--the State of the Art in 1996* (Avian Power Line Interaction Committee 1996) to avoid potential electrocution impacts. SCE has designed the project to avoid the area's black-tailed prairie dog colonies. Prior to construction, the two colonies within the survey corridors would be searched for burrowing owls and their sign, and if they occur in the colony, construction may be delayed within 0.5 mi of the colony until after the nesting season (August 1). SCE would conduct a raptor nest survey prior to construction, and any active nests would be avoided by an appropriate buffer until the chicks have fledged or the nest fails. SCE would conduct mountain plover surveys in all potential habitat prior to construction, and, if nests are found, SCE would avoid construction within 0.25 mi of a nest until the chicks are mobile (about 35 days after the nest is discovered or 7 days post-hatching) unless otherwise approved by Western. Employees would be instructed on how to identify mountain plover and to avoid driving in areas where plover are seen until the area has been inspected for nests by a qualified biologist.

3.8 CULTURAL RESOURCES

3.8.1 Environmental Setting for the Proposed Project

The Spring Canyon wind project is situated within the Great Plains Province of the Platte River Basin Colorado prehistoric context area (Gilmore et al. 1999). Human occupation of this region dates back to the Paleoindian Stage (12,000-7,500 years before present [B.P.]). This stage refers to a subsistence system in which people utilized now-extinct megafauna including mammoth and bison. Clovis, Folsom, and Plano occupations, although scant, are found in northern Colorado in the Great Plains Province, mostly south and west of the current project area. Site settlement patterns suggest that Paleoindian occupations favored river terraces, although some sites are situated in sand dune locales (Gilmore et al. 1999:83).

The Archaic Stage follows the big game hunting of the Paleoindian Stage (7,500 years B.P.- AD 50). This stage is characterized by a broader subsistence spectrum including collecting of plant resources, as evidenced by numerous grinding stones found at Archaic Stage sites, and small game hunting. The Archaic Stage of the Platte River Basin of Colorado is divided into Early, Middle, and Late Archaic periods. Based on radiocarbon age frequencies, the Great Plains Province has a greater number of sites dating to the Middle and Late Archaic periods. A number of Archaic Stage site types have been identified for this region, including open and sheltered lithic scatters, camps, and architectural sites; quarries; kill sites; game processing and butchering sites; ceremonial sites; burials; and rock art. Research topics and data needs for the Plains area of northeastern Colorado include chronological refinement and the relationship between the Archaic and Paleoindian as well as the Archaic and the Late Prehistoric, refinement of projectile point typologies such as McKean and Mountain Side-Notched, lithic source identification, and subsistence and seasonality studies.

The final prehistoric period for this region of Colorado is the Protohistoric Stage (AD 1540- AD 1700). At about AD 1500, the Plains area of Colorado returned to a more normal climatic condition after several hundred years of drought, leading to a repopulation of this area. Protohistoric site types are mostly open camps and lithic scatters, although other types including stone circle habitations, rock art, battlefields, trails, and peeled trees have been noted. Apache and Kiowa groups, among others, who migrated south from Canada, entered the northern and Central High Plains as nomadic hunter-gatherers with little evidence of sedentism or agriculture. Few sites have been dated to this time period, and even fewer have diagnostic artifacts that can identify the cultural affiliation of the sites. Combined, ethnographic and ethnohistoric records can be used, in conjunction with the archaeological record, to make such determinations. However, research must focus on diagnostic artifact types and materials to identify Protohistoric sites and patterns.

During the late Prehistoric period, the Arapaho and Atsina (Gros Ventres), both of Algonquian linguistic stock, were located in the region of central and southeastern Montana. The Arapaho then migrated to the southeast, most likely pressured by the Blackfeet tribes. The Kiowa and affiliated Kiowa Apache lived near the head of the Missouri River in southwest Montana. They migrated gradually southeastward, allied for a time with the Crow, lived in or near the Black Hills, and then were gradually forced south to the southern plains by the Arapaho and Cheyenne. The Lakota Sioux claim to have driven them south out of the Black Hills (Swanton 1952:295, 386-387). The Northern Cheyenne migrated westward from Minnesota after 1700, and by 1800, they allied with the Lakota Sioux and ranged throughout the region of the headwaters of the North Platte and Yellowstone Rivers (Swanton 1952:279).

The Northern Cheyenne and Northern Arapahoe migrated south to the region surrounding the project area in the latter part of the eighteenth century. Their use of the area as highly mobile equestrian plains hunters focused almost exclusively on the bison economy supplemented by wild fruits, berries, and other plant resources in the riparian areas that dotted the plains. Fur trade journals and published reports from early nineteenth-century U.S. Army topographic expeditions documented the use of the region by the Northern Cheyenne and Northern Arapahoe (e.g., Fremont 1845; Stansbury 1852). Their migratory use of the northern Colorado plains continued until the reservation period following 1870. The Pawnee, one of the principal tribes of the caddoan linguistic stock, occupied regions to the east along the Platte and Republican Rivers (Swanton 1952). Early to mid-nineteenth-century Native American site types likely to occur in the region include stone circle camps or ceremonial sites, lithic scatters and hearth features, and marker or driveline cairns.

Territorial boundaries of tribal and band-level societies on the northern plains were in a constant state of flux during the Protohistoric period and into the early 1800s. The northward diffusion of the horse from the southwest reached the northern plains in the eighteenth century (Haines 1938). In turn, the southern diffusion of the gun and other fur trade merchandise from the northeast and upper midwest reached the plains in the same century. Both the horse and gun were acquired by some tribes sooner than others, depending on the tribe's proximity to the source and intertribal trade patterns. Acquisition of the horse by Northwestern Plains tribes during early to mid-eighteenth century increased mobility and carrying capacity, and both the horse and gun altered the military balance of power, especially for those tribes that acquired both early, such as the Blackfeet and the Crow (Secoy 1953). As a result, migratory patterns of subsistence throughout the Northwestern Plains region were influenced by these events.

After the close of the Civil War and construction of the transcontinental railroad in 1865 and 1869, respectively, the northeastern plains of Colorado were open for homesteading during the post-war period of United States western expansion. By the end of the century, Logan County was well-settled and dotted with farmsteads and ranches practicing dry land and irrigated farming techniques. Historic sites likely to occur in the region include, but are not limited to, the remains of homesteads, cabins, corrals, water wells, windmills and tanks, outbuildings and foundation imprints.

A file search was conducted at the Colorado Historical Society on October 14, 2004, for all of the sections for the proposed project area within Townships 11N and 12N, Ranges 50W and 51W. A supplemental file search was conducted on March 29, 2005. The file searches indicate that three cultural resource inventories have been conducted and four sites have been recorded. The previous inventories were conducted for two pipelines (the Trailblazer Pipeline in 1981 [Weir and Hunt 1981] and the KN Nebraska-Colorado Pipeline in 1991[Travis and O'Brien 1991]) and one transmission line (the Sidney to North Yuma 230-kv transmission line [Jepson 1991]). While these linear projects were quite lengthy, the portions that overlapped with the currently proposed project area are small ranging in width from 100 to 200 ft. The expectation of these previous inventories was to find prehistoric open camps and lithic scatters and historic trash scatters. Historic ranches were not expected due to the design of these projects to avoid such resources. The 1981 Trailblazer Pipeline recorded two prehistoric sites and four prehistoric isolates in Colorado. The 1991 KN Nebraska-Colorado Pipeline recorded no cultural materials in Colorado. The 1991 Sidney to North Yuma 230-kv transmission line recorded six prehistoric sites and eight prehistoric isolates in Colorado.

The four sites recorded in the currently proposed project area include three historic sites and one prehistoric site. The three historic sites are recommended as not eligible for listing on the NRHP. They consist of the Peetz Water Tank (Site 5LO211), the J.R. Portner House (Site 5LO274), and the Wood House (Site 5LO275). These three sites are not associated with any accessioned projects and were recommended as not eligible to the NRHP due to the lack of structural integrity at the time of the inventory. The prehistoric site (Site 5LO286) is an open camp and lithic scatter that is recommended as not eligible for the NRHP due to its lack of intact subsurface archaeological deposits and moderate disturbance to the site. The site was recorded during the inventory for the Sidney to North Yuma 230-kv transmission line. Chert and quartzite debitage was found with no diagnostic artifacts noted. In addition, two prehistoric isolated finds (5LO190 [recorded during the inventory of the Trailblazer Pipeline] and 5LO281[recorded during the inventory for the Sidney to North Yuma 230-kv transmission line]) have been determined as not eligible for the NRHP. Based on the file search, no TCPs are known to occur within the project area. The Class III inventory, while not specifically attempting to identify TCPs, did not locate cultural features usually associated with Native American sensitive sites (e.g., stone circles, rock cairns or alignments, or rock art). No interviews were conducted with local groups, individuals, or tribes. However, Western sent letters to 13 tribal entities requesting their interest or issues for the proposed project. To date, only the Oglala Sioux tribe responded that they would have a formal response in February. No such response was forwarded to Western.

General Land Office (GLO) plat maps, Master Title Plats, and historical indices, for Townships 11N and 12N, Ranges 50W and 51W were reviewed. These documents indicate that homesteads dating to the second decade of the twentieth century are present in the project area.

A Class III inventory for the Spring Canyon wind project was conducted between February 19 and April 3, 2005, within the 2,000-ft wide survey corridor, as well as the 50-ft corridor (see Figure 2.1). The inventory resulted in the identification of 14 newly recorded prehistoric and nine newly recorded historic sites, as well as 43 isolated finds. All of the newly recorded sites are recommended as not eligible for listing on the NRHP. Previously recorded NRHP-ineligible prehistoric Site 5LO286 could not be relocated during the inventory. No Traditional Cultural Properties (TCPs) are known to occur within the project area, and no TCPs were identified during the current inventory.

3.8.2 Environmental Impacts and Mitigation Measures

3.8.2.1 Significance Criteria

Impacts to cultural resources would be considered significant if any cultural resource site eligible for the NRHP is disturbed during construction or operation of the wind project.

3.8.2.2 Impacts of the Proposed Project

No NRHP-eligible cultural resource sites were identified during the current Class III cultural resource inventory for the project. The nine historic and 14 prehistoric sites recorded during the inventory are all recommended as not eligible for the NRHP. No TCPs are known to occur within the project area, and no TCPs were identified during the current inventory. Because the sites are recommended as not eligible for the NRHP, construction activities would have no project effect on these cultural resources.

If a previously undiscovered site or TCP is exposed and discovered during construction, all activity would be halted. The site would be inspected and evaluated by Western to determine if the site is eligible for the NRHP and the treatments necessary--in consultation with SCE and the SHPO--to avoid further impacting the site. This standard approach to handling unanticipated cultural resource discoveries within the project area would ensure that impacts to cultural resources due to the proposed project would not be significant.

3.8.2.3 Impacts of the No Action Alternative

No impacts to cultural resources would occur under the No Action Alternative.

3.8.2.4 Mitigation

No additional mitigation is proposed.

3.9 LAND USE, TRANSPORTATION, AND RECREATION

3.9.1 Environmental Setting for the Proposed Project

Land use within the project area is primarily agricultural, with dryland wheat and millet the principal crops. Large areas of CRP land also occur in the project area (see Section 3.5.1). A few areas of native prairie, used for livestock grazing, also occur. Other land uses include transportation (roads and pipelines), power transmission, residential use, and recreation (big game and pheasant hunting). Colorado State Highway 113 on the western side of the project area and an extensive network of gravel-surfaced county roads has been constructed throughout the project area. There are no state or national parks, Wild and Scenic rivers, or other areas of recreational, scenic, or aesthetic importance in the project area. Since the project area is entirely located on private land, recreation is generally limited to the landowners themselves or granted to others by the landowners, except for use of the county roads to access off-site recreational areas (which are limited because most of the region is privately owned). One landowner conducts guided pheasant hunts, and big game is hunted with landowner permission.

There are two recreational vehicle (RV) parks in the Sterling area—North Sterling State Park and Yogi Bear’s Jellystone Park that, combined, offer 131 private camp sites and 30 hook-up sites for RVs (Logan County Chamber of Commerce 2005a, 2005b). Other camping areas include Prewitt Reservoir, Tamarack Ranch Wildlife Area, Jumbo Reservoir, and Crow Valley Recreation Area. Fleming City Park in Fleming, Colorado, also offers camping. There are three

RV parks near Sidney, Nebraska--Cabela's RV Park and Full Service Campground, Point of Rocks Motel and RV Park, and Bear Family RV Park (Sidney Chamber of Commerce 2005).

Bounded on the north by Interstate 80 (I-80) and on the south by I-70, and bisected by I-76, northeastern Colorado has excellent transportation services (Northeastern Colorado Economic Developers 2004). State Highway 113 forms the western boundary of the project area, so there is good, improved access to the project area. Burlington Northern-Santa Fe and Union Pacific provide rail service to the region. Denver International Airport is just over an hour away.
Logan County has issued a Conditional Use Permit for the project.

3.9.2 Environmental Impacts and Mitigation

3.9.2.1 Significance Criteria

Impacts to land use, transportation, and recreation would be significant if the proposed project precluded continuation of current land uses within the area surrounding the project.

3.9.2.2 Impacts of the Proposed Project

The project would result in the initial disturbance of approximately 84 acres of shortgrass prairie, 102 acres of agricultural land, and 36 acres of CRP land. Life-of-project disturbance would include disturbance of 26 acres of shortgrass prairie, 32 acres of agricultural land, and 11 acres of CRP land. All existing land uses would continue as they are prior to development, with the possible exception of hunting, which would be precluded in the vicinity of wind turbines, transformers, and other facilities that could be damaged by ammunition fired during hunting. This may have a minor effect on a landowner's income, as well as the recreational use of the area by hunters--the income impacts would be more than offset by the rent paid by SCE. The reduction in hunting opportunity would be small.

Traffic will increase on the roads leading to and within the project area during the construction stage, as equipment is transported into the area. Large pieces of equipment such as rotor blades are over-sized loads that may temporarily slow traffic as they are moved into the project area. This additional heavy traffic would also cause additional wear on existing roads, but transportation would be conducted in accordance with Colorado Department of Transportation Regulations and, thus, adverse impacts to roads is not anticipated. Project area roads are crowned, ditched, and graveled, and are capable of supporting heavy loads. Only minor rutting along county roads was noted during the construction of the existing wind project west of Peetz (personal communication, March 2005, with Chad Wright, Operations Manager, Logan County Road and Bridge Department, and Gary Gillham, landowner). This will be a short-term, direct impact during the construction phase. Large pieces of agricultural equipment and trucks are common in the project area so the introduction of additional large equipment associated with the wind project will have minor impact on transportation. Large pieces of equipment may occasionally impact transportation during the O&M phase but most O&M traffic will be pick-up trucks and medium-sized trucks similar to those presently used for agricultural activities. The increase in traffic will not cause a major change in the transportation network in the project area. Impacts to land use, transportation, and recreation due to the Proposed Project would not be significant.

3.9.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, land use, transportation, and recreation would remain the same.

3.9.2.4 Mitigation Measures

Heavy loads would be prohibited on the gravel county roads when conditions are too wet to support traffic without creating ruts greater than 4 inches deep.

3.10 PUBLIC HEALTH AND SAFETY

3.10.1 Environmental Setting for the Proposed Project

Public access to private lands is already restricted by landowners and would continue to be restricted in accordance with easement agreements. Existing safety hazards would include traffic on county roads and Highway 113, potential for fires, and possible accidents related to agricultural activities. No public safety issues have arisen from the existing wind project west of Peetz (personal communication, March 2005, with Roger Japp, Logan County Under Sheriff).

School buses travel in the project area between 7:00 and 8:00 a.m. and between 3:30 and 4:30 p.m. (personal communication, March 2005, with Bob Long, Peetz Schools). There are about approximately eight stops within the project area and one on Highway 113. Students are transported either to the elementary school or combination middle school/high school in Peetz.

3.10.2 Environmental Impacts and Mitigation Measures

3.10.2.1 Significance Criteria

Impacts to public health and safety would be considered significant if the Proposed Action resulted in loss of life, limb, or property.

3.10.2.2 Impacts of the Proposed Project

Potential public health and safety impacts could include the following:

- traffic accidents,
- traffic accidents involving the railroad crossing in the town of Peetz,
- unanticipated fires,
- electrocution from high voltage equipment,

- interference with school buses or emergency vehicles, and
- electromagnetic interference (EMI) with local aircraft radar or television signals.

With the implementation of mitigation described below, these impacts should not occur or would be unlikely.

3.10.2.3 No Action

Under the No Action Alternative, no impacts to public health and safety would occur.

3.10.2.4 Mitigation Measures

Truck drivers, construction workers, residents, and any visitors to the project area are expected to obey traffic laws. All drivers are expected to exercise caution when crossing the at-grade railroad crossing in the town of Peetz.

All fires would be extinguished immediately by SCE personnel, if there is no danger to life or limb, and the appropriate landowner and the county sheriff's department would be notified immediately. Some fire-fighting equipment would be located in vehicles and in the O&M facility. If the fire cannot be extinguished by SCE personnel, the landowner and sheriff would be so advised. Fire deterrents within the wind farm would include access roads, which may serve as fire breaks and regular clearing of vegetation from areas around transformers, riser poles, and buildings.

The substation would be fenced as required for public safety, but no other fencing is proposed at this time.

Safety signing would be posted around all towers, where necessary, transformers, and other high voltage facilities, and along roads, in conformance with applicable state and Federal regulations.

In the event that the project results in impact to radar, microwave, television, or radio transmissions, SCE will work with the owner of the impacted communication system to resolve the problem. Potential mitigation may include realigning the existing antenna or installing relays to transmit the signal around the project (BLM 2004). Additional warning information may also need to be conveyed to aircraft with onboard radar systems so that echoes from wind turbines can be quickly recognized.

The FAA requires a notice of proposed construction for a project so that it can determine whether it would adversely affect commercial, military, or personal air navigation safety (BLM 2004). The proposed project would meet all appropriate FAA criteria, so no adverse impacts to aviation would be expected.

3.11 NOISE

3.11.1 Environmental Setting for the Proposed Project

The A-weighted decibel scale (dBA scale) measures sound levels over the entire range of audible frequencies, weighted to accommodate the fact that humans hear middle range frequencies better than high or low frequencies. The dBA of commonly heard sounds is presented in Table 3.6.

The project area is rural farmland and native prairie, with homesteads, agricultural activities, state and county roads, and the wind as the major contributors to ambient noise levels. Ambient noise levels are likely in the range of 20-55 dBA (BLM 1995; British Wind Energy Association 2004), depending on time of day and proximity to human activities, State Highway 113, or the railroad. Noise levels within the project area are likely lowest during the morning and at night

Table 3.6 Noise Levels of Commonly Heard Sounds.[1]

Source/Activity	dBA
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind project at 1100 ft	35-45
Car at 40 mph at 300 ft	55
Busy office	60
Truck at 30 mph at 300 ft	65
Jet aircraft at 800 ft	105
Threshold of pain	140

[1] Source: British Wind Energy Association (2004). dBA = A-weighted decibels.

(e.g., 20-40 dBA) when wind speeds are lower, and highest (e.g., 55 dBA) in the afternoon when wind speeds are higher. A truck operating at 30 mph generates about 65 dBA at a distance of 300 ft; farm equipment likely is somewhat noisier. Passenger cars traveling 50 mph generate about 65 dBA at 50 ft and diesel trucks generate about 85 dBA at 50 ft, so near State Highway 113, traffic noise levels are likely in the range of 65 to 85 dBA. Noise levels drop with the square of distance from the source (Figure 3.10), so noise levels at 200 ft from Highway 113 would be about one-quarter of levels at 100 ft.

Noise-sensitive receptors within the project area are residences and wildlife. SCE has designed the project so that all turbines are at least 1,000 ft from the nearest residence--one exception has been granted by a landowner to permit a turbine to be located within about 900 ft from his residence. The nearest known raptor nest is within about 900 ft of a turbine. The proposed substation would be located about 2,000 ft from the nearest residence and approximately 0.6 mi from the nearest known raptor nest.

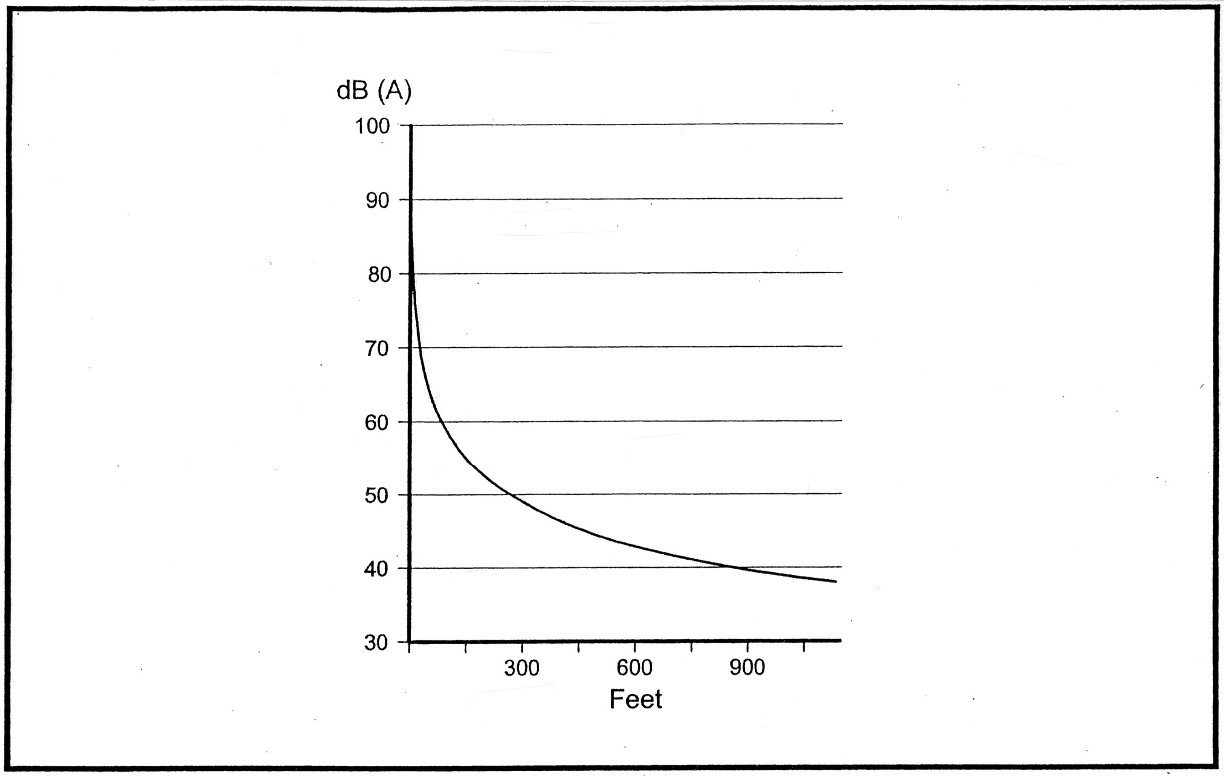

Figure 3.10 Noise Levels and Distance from the Source.

3.11.2 Environmental Impacts and Mitigation Measures

3.11.2.1 Significance Criteria

Impacts from noise would be considered significant if the project's operation resulted in regular annoyance to the area's residents.

3.11.2.2 Environmental Impacts

Construction noise will exceed ambient noise levels and may be heard for some distance within the project area. Truck traffic, heavy equipment, and possibly foundation blasting would cause elevated noise levels at and near construction sites. These impacts will be moderate, probably disrupting residents and wildlife during construction hours, but temporary and similar to noise present as a result of the operation of agricultural equipment throughout the project area. SCE will minimize construction noise impacts by ensuring that construction equipment is maintained and properly muffled, limiting the amount of equipment on-site to that which is necessary for construction, and limiting construction activities to daytime hours.

Noise impacts associated with operations are expected to be minimal to humans. At the base of a wind turbine, it should be possible to have a conversation without raising one's voice (American Wind Energy Association [AWEA] 2004a). At the nacelle, the wind turbines proposed for this project generate about 100 dBA, depending on wind speed. At one rotor distance (150 ft) from typical wind turbine, noise levels are 55-60 dBA. At four rotor distances (about 600 ft), noise levels are about 44 dBA, and at six rotor distances (900 ft), turbine noise is about 40 dBA.

Both the nearest residence and the nearest known raptor nest are approximately 900 ft from the nearest wind turbine, so wind turbine noise levels would be about 40 dBA, similar to rural night-time ambient noise levels.

Modern turbines emit a swishing or whooshing noise that is caused as rotors encounter turbulent air. Most of the hum or whine and the thumping noises generated by older model turbines have been eliminated in modern turbines.

Generally, the sound of the wind will mask turbine noise, especially since turbines only operate when wind speeds reach a certain threshold. SCE will use state-of-the-art turbines that have been designed to minimize noise levels (e.g., upwind rotors, thinner blade tips, streamlined towers and nacelles), so it is anticipated that wind turbine noise impacts to residents and wildlife would not be significant. Landowners near the existing wind project west of Peetz occasionally hear the turbines but do not find them annoying (personal communication, March 2005, with Gary Gillham, landowner). Noise from trains in Peetz is louder than from the existing wind project.

Substations emit both transformer noise and switchgear noise. Transformers emit a low-frequency humming noise (caused by vibrations within the transformer) that is generally between 43 dBA (for a 60-MW project, roughly equivalent to the Phase I project) at a distance of about 500 ft (BLM 2004). Substation noise at 150 ft for a 160-MW project (slightly larger than the full build-out) would be about 46 dBA. These noise levels at about 1,640 ft would be 33 and 36 dBA, respectively, so substation noise levels at the nearest residence and nearest known raptor nest would be below ambient levels.

Because wind turbine and substation noise would be at or below ambient levels at the nearest residences, noise impacts to residents would not be significant.

3.11.2.3 Impacts of the No Action Alternative

Under the No Action Alternative, the area's noise levels would not change due to the project.

3.11.2.4 Mitigation Measures

No additional mitigation is proposed.

3.12 VISUAL RESOURCES

3.12.1 Environmental Setting of the Proposed Project

The area exhibits a typical rural setting with both occupied and abandoned farmsteads scattered along gravel roads throughout the landscape, which is a mixture of tilled and CRP agricultural fields and native grassland used as pasture. Many farmsteads have shelterbelts around the perimeter. Buildings within Peetz, particularly the grain elevators, dominate the view west of the project area, and the landscape already has a significant wind power component in the existing wind project west of Peetz. The landscape is characteristically flat to rolling, with the green and brown colors of the agricultural fields, linear features such as roads and transmission lines, and it is punctuated with the galvanized steel of grain elevators. The area is not within sight of any highly sensitive visual elements (e.g., Pawnee National Grassland), and the visual elements of proposed project area are quite common in eastern Colorado.

3.12.2 Environmental Impacts and Mitigation

3.12.2.1 Significance Criteria

Impacts to visual resources would be considered significant if construction of the wind project would result in high visual contrasts in highly sensitive or visually unique areas in proximity to high to medium numbers of high sensitivity viewers.

3.12.2.2 Environmental Impacts

The wind turbines would change the aesthetics of the landscape with the addition of more tall towers and rotating blades--whether this effect is deemed a beneficial or adverse effect depends on viewer perspective and sensitivity. The proposed wind project probably would be more visible than the existing wind project west of Peetz because the turbines would be taller and there would be more of them.

Figures 3.11-3.14 provide visual simulations of the project from four vantage points--two views from south of Peetz on Highway 113, one view from Peetz, and one view from west of Peetz. Figure 3.15 shows visual simulation locations. The visual simulations were developed based on the dimensions of a typical wind turbine (Figure 2.2) and proposed turbine locations in UTM coordinates. The turbines were simulated facing northwest, since prevailing winds are from the northwest and these would be upwind turbines.

The substation, access roads, overhead power lines, vehicles, and dust would also impact visual resources. The substation would be viewed most frequently by local landowners, and it would represent an industrial facility in a rural landscape. The project area already contains 41.4 mi of roads; construction of approximately 26 more miles would constitute a 63% increase in the number of roads in the project area. During construction, vehicles and dust would be a fairly constant presence in the project area; during operation, vehicle traffic would be only slightly more than current traffic levels.

The AWEA recently sponsored a series of meetings to develop recommendations improving aviation safety while allowing wind development to proceed (AWEA 2004). Current FAA requirements for wind turbine lighting typically includes red, simultaneously pulsating night-time lighting and no daytime lighting (white towers are sufficiently conspicuous to pilots). Red night-time lights are less intrusive to humans than white night-time lights (AWEA 2004b). SCE is preparing a lighting plan to meet FAA requirements while minimizing the number of lights for the project.

3.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.13.1 Environmental Setting for the Proposed Project

For the purposes of this EA, the area of potential effect for socioeconomic impacts includes the towns of Peetz and Sterling, Colorado; Sidney, Nebraska; and Logan County, Colorado.

The project area is located in a rural, agricultural area east of Peetz, in Logan County, Colorado. In 2000, the population of Peetz was 227 (Wikipedia 2004a). The town contains 99 housing units, with 90 households and 63 residing families. The population is predominantly white (95.6%); minorities make up 15.0% of the population. (The demographic data for minorities include white and non-white Hispanics and Latinos, so totals will be more than 100%.) Median age is 37 years. Median household income is $42,083; median family income is $47,614. Per capita income is $19,172. An estimated 7.3% of the population and 4.3% of families are below poverty level.

Sterling, Colorado, is located approximately 25 mi south of the project area. In 2000, Sterling's population was 11,360 (Wikipedia 2004b). Sterling has 5,171 housing units with 4,604 households and 2,790 families residing in the city. The population is predominantly white (90.8%), with 22.7% minorities. Median age is 35 years. Median household income is $27,337; median family income is $39,103, and per capita income is $15,287. An estimated 15.2% of the population and 11.5% of the families are below poverty level.

Sidney, Nebraska, is located approximately 10 mi north of the project area. In 2000, Sidney's population was 6,282 (Wikipedia 2004c). Sidney had 2,890 housing units, with 2,621 households, and 1,672 families residing in the city. The population is predominantly white (95.22%) with 10.7% minorities. Median age is 38 years. Median household income is $33,935; median family income is $41,050, and per capita income is $17,158. An estimated 9.0% of the population and 7.0% of the families are below the poverty level.

Logan County's population is an estimated 20,928 (U.S. Census Bureau 2004), and Sterling is the main population center. Population density is about 11.2 persons/square mi. Population increased by 16.7% between 1990 and 2000. In 2002, there were 8,623 housing units in Logan County, and homeownership rate was 69.9%. There are an estimated 7551 households, with a median household income of $32,724. Logan County's population is predominantly white (91.7%), with minorities comprising 15.6% of the population. An estimated 12.2% of the population is below poverty level.

Northeastern Colorado has a large pool of skilled workers (Northeastern Colorado Economic Developers 2004). Farm households have substantially higher levels of job-related skills than non-farming households, including welding, small and large engine repair, computer use, large and small animal care, agriculture/gardening, and machining.

Each Federal agency is to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations" (Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 1994, 59 *Federal Register* [FR] 7629).

The Presidential Memorandum accompanying the Executive Order directs Federal agencies to "analyze the environmental effects, including human health, economic and social effects of Federal actions, including effects on minority communities and low-income communities when such analysis is required by the National Environmental Policy Act."

EPA defines environmental justice as "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies."

In addition, the Council on Environmental Quality provides input on NEPA compliance with Executive Order 12898 in its Environmental Justice Guidance under NEPA, December 1997.

Low income communities are defined by EPA as communities where the percentage of the population below poverty level is greater than the state average. Currently, 9.3% of Colorado's population is below poverty level. In Peetz, only 7.3% is below the poverty level; thus, Peetz is not a low-income community. In Sterling, 15.2% of the population is below the poverty line, so Sterling would be considered a low-income community. Only 7.0% of Sidney's population is below the poverty level (Nebraska's average is 9.7%) so Sidney is not classified as a low-income community.

Minority communities are defined by EPA as communities where the percent of minorities is larger than the state average. Colorado's minorities make up 25.5% of the state's population. Minorities make up 15.0% of Peetz population, so Peetz is not a minority community. The minority population of Sterling is 22.7% and in Logan County, minorities make up 15.6% of the population. Sidney's population consists of 10.7% minorities, whereas Nebraska's average is 12.7%.

3.13.2 Environmental Impacts and Mitigation Measures

3.13.2.1 Significance Criteria

Impacts to socioeconomics would be considered significant if project-related population increases result in housing or public service demands that could not be met by existing or currently planned facilities. Impacts related to environmental justice would be considered significant if the project caused disproportionately high impacts on low-income or minority communities.

3.13.2.2 Impacts of Proposed Project

Approximately 20 people per day for 180 days would be required for wind project construction. Substation construction would require approximately 5 people for 90 days. Reclamation would require about 4 people for 30 days. Most construction workers are expected to commute from Sterling, Colorado; Sidney, Nebraska; and possibly Cheyenne, Wyoming, and surrounding areas. Specialty construction workers, with specific wind power construction experience, would come from out-of-state, and the out-of-state work force is expected to be about 50% or about 12 workers, who would likely commute to either Sidney or Sterling during the construction period. Sterling has 585 vacant housing units (Wikipedia 2004b) and over 175 hotel rooms (Trip Advisor 2004a). Sidney has 498 vacant housing units (Wikipedia 2004c) and over 205 hotel rooms (Trip Advisor 2004a). There is adequate housing and associated infrastructure to support the 12 additional workers during the construction period. No new infrastructure would be required.

Because additional workers would be in the area and because there would be an increase in traffic, the project would result in small increase in need for additional law enforcement; however, no public safety issues were noted during construction of the existing wind project west of Peetz (personal communication, March 2005, with Roger Japp, Logan County Under Sheriff).

The project would generate sales and use taxes for goods and services purchased during construction and operation (Table 3.7). It would also provide property taxes to the town of Peetz and to Logan County. The project would employ 25 workers during construction and would create 8-10 permanent O&M jobs. All of these impacts would be beneficial to the affected towns/cities, to Logan County, and to the State of Colorado. Logan County and the City of Sterling are low-income communities in the area of potential effect, but the project is expected to generate revenue needed by the county and the city, so no adverse effects to low-income communities would occur. Furthermore, the project would generate revenue for the private landowners on whose land the project is located, further benefiting the area's economy.

The following discussion of wind development impacts on property values was excerpted from the U.S. Bureau of Land Management's Draft Programmatic Environmental Impact Statement on Wind Energy Development of BLM-Administered Lands in the Western United States (BLM 2004).

Table 3.7 Expected Revenues to Local Landowners and Governments from the Proposed Project.

Source of Revenue/Benefit	**Estimated Amount of Revenue/Benefit (Life-of-Project)**
Sales, use, and property taxes	$12,800,000
Landowner income	$9,400,000
Construction employment	25 temporary full-time jobs
O & M employment	8-10 permanent full-time jobs

> The potential impact of wind development projects on residential property values has often been a concern in the vicinity of locations selected for wind power. Although this PEIS does not directly assess the potential impacts of wind power on property values, a review of two studies that examined potential property value impacts of wind power facilities suggests that there would not be any measurable negative impacts.
>
> ENONorthwest (2002) interviewed county tax assessors in 13 locations that had recently experienced multiple-turbine wind energy developments. While not all the locations chosen had wind turbines that were visible from residential areas, and some development projects had been constructed too recently for their full impact to be properly assessed, the study found no evidence that wind turbines decreased property values. Indeed, in one area examined, it was found that designation of land parcels for wind development actually increased property values.
>
> Sterzinger et al. (2003) analyzed the effects of 10 wind energy development projects built during the period 1998 to 2001 on housing sale prices. The study used a hedonic statistical framework that attempted to account for all influences on changes in property value; its data came from sales of 25,000 properties, both within view of recent wind energy developments and in a comparable region with no wind energy projects, before and after project construction. The results of the study indicate that there were no negative impacts on property values. For the majority of the wind energy projects considered, property values actually increased within the viewshed of each project, with property values also tending to increased faster in areas with a view of the wind turbines than in areas with no wind projects.

As with mineral rights, property owners in the area hold wind power rights to increase property values.

3.13.2.3 Impacts of No Action Alternative

Under the No Action Alternative, the affected towns/cities, Logan County, and the State of Colorado would not realize the sales and use or property taxes potentially generated by the wind project, and private landowners would not realize the additional income from easements on their property.

3.13.2.4 Mitigation Measures

No mitigation is proposed.

3.14 CUMULATIVE IMPACTS

Cumulative impacts are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor to collectively significant actions taking place over a period of time (C.F.R. 1508.7).

The natural, human, and cultural environment within the project area and in the general region has been substantially altered by the long-practiced agricultural activities, especially crop production, which is widespread in the project area. The major agricultural activities have resulted in widespread conversion of shortgrass prairie to farmland and rural residential development. Other developments that have affected the project area and the region include another wind project (about 35 turbines); transportation (roads, highways, railroads, pipelines, transmission lines); small towns with businesses to provide goods and services to the rural communities; and water development (e.g., irrigation ditches, wind mills, stock ponds). Western's 230-kV Sidney to North Yuma transmission line bisects the project area. Other wind developments may be leasing land within the region, but no applications have been filed with Logan County (personal communication, March 2005, with Dustin McCormick, Logan County), so specific development plans are not currently known. SCE may opt to lease additional lands for future expansion of the Spring Canyon wind project, but other than the completion of the 130-MW project described herein, no foreseeable development is proposed. No reasonably foreseeable future developments are known, so the cumulative impacts assessment includes the Proposed Action and the above-referenced management activities and developments.

3.14.1 Climate and Air Quality

Cumulative impacts to climate and air quality would be similar to those described for the Proposed Action. Climate would not be incrementally impacted by the project. Air quality would be slightly impacted during construction and operation. In addition, cumulative impacts of the two wind projects would produce more electric power from a non-polluting source. Cumulative effects of the two wind projects would produce electric power from a non-polluting source, resulting in a small incremental improvement in air quality when compared to burning coal for electric power. However, the air quality improvement would not necessarily occur within the project area.

3.14.2 Geology, Paleontology, and Soils

Cumulative impacts to geology would include excavation in bedrock to dig the turbine foundations, as described for the Proposed Action.

Other excavation in the Ogallala formation has the potential to impact paleontologic resources, and the project would contribute minimally to cumulative impacts to paleontology. If the project is determined not likely to uncover important fossils, cumulative impacts would be minor. However, there is potential to uncover scientifically important fossils, excavation would be monitored by a qualified paleontologist, any discoveries would be recorded and preserved, as appropriate, and impacts would be beneficial due to the contribution to the paleontological record.

Soils have already been highly impacted by farming and other agricultural activities. The proposed project would disturb up to 222 acres of soils, most of which are already disturbed. Therefore, cumulative impacts to soils would be negligible.

3.14.3 Water Resources

Cumulative impacts to surface water quantity would be minimal because any surface waters used would be obtained from existing permitted sources and would not impact other users. The amount of surface water used would be minor compared to the amount used regionally for irrigation (Topper et al. 2003). Cumulative impacts to surface water quality is already largely affected by agricultural activities, including wind and water erosion from plowed fields and irrigation return water. Dust from traffic on the area's gravel roads and railroads, maintenance on the pipelines and power lines, and residential and commercial activities (including O&M on the existing wind project) all contribute small amounts of sediment to surface waters. The project would result in the disturbance of up to 222 acres during construction; however, SCE would use best management practices to minimize erosion and downstream sedimentation, so the incremental impact to surface water quality would be minimal.

Existing wells in the project area are used for irrigation, stock watering, and domestic use and, in northern Colorado, water levels in the Ogallala aquifer have dropped about 10 ft between 1990 and 2000 (Topper et al. 2003). The project would consume 2,798,375 gallons of water (surface and/or ground water) from existing permitted sources for foundation concrete and dust control during construction (see Section 2.2.7). The project would contribute only slightly to ground water consumption. Ground water quality in the project area would not be impacted, and cumulative ground water quantity or quality impacts are anticipated to be minimal.

3.14.4 Floodplains and Wetlands

The project would not impact floodplains or wetlands. As noted in Section 3.4, many floodplains and wetlands within the project area are farmed and thus previously impacted. The Proposed Action would not cause significant cumulative impacts to floodplains or wetlands.

3.14.5 Vegetation

Vegetation within the project area is largely cropland (12,660 acres), with a few areas of native prairie (7,094 acres), and CRP land (2,300 acres). The proposed project would create up to 222 acres of disturbance--84 acres of native prairie, 102 acres of cropland, and 36 acres of CRP land, so the incremental increase in vegetation disturbance would be minor. Cumulative impacts to vegetation would not be significant.

3.14.6 Wildlife

Cumulative impacts to wildlife would be similar to those described for the Proposed Action because land use within and adjacent to the project area is subject to regular human activity from farming and ranching activities. Large tracts of native habitat have been replaced with cropland which provides non-native habitat for some species while displacing other species. The CRP land, rangeland, and grasslands in the region provide habitat for a wide number of species; however, existing human disturbance and activity adversely impact some species. Black-tailed prairie dog, burrowing owl, mountain plover, ferruginous hawk, and swift fox are shortgrass prairie species that are now state-listed species due to widespread loss of shortgrass prairie habitat. The project would disturb up to 222 acres of habitat, of which 84 acres would be native prairie, 102 acres would be cropland, and 36 acres would be CRP land. Therefore, the proposed project would contribute only minimally to habitat loss and, cumulatively, would not significantly impact wildlife.

Direct cumulative impacts to avifauna (i.e., collision-related mortality) would result from the presence of above-ground features such as communications towers, grain elevators, transmission lines, vehicles on highways, windows, and the two wind projects, as well as mortality caused by other factors (e.g., house cats) (NWCC 2001). However, mortalities at wind projects has been documented to be low compared with other sources of mortality (Table 3.2) (NWCC 2001), and, while the project probably would cause some mortality, collisions are anticipated to be rare events and thus not significant.

3.14.7 Special Status and Sensitive Species

Cumulative impacts to special status species would be similar to those described for the Proposed Action. All development activities must comply with the *Endangered Species Act*, which requires avoidance or mitigation for impacts to TEP&C species, so no significant cumulative impacts to T&E species would occur. By avoiding black-tailed prairie dog colonies, the project would have minimal to no impacts on state-listed species. Cumulatively, the region's agricultural activities have had greater impact on habitat than other developments, and most of the project's disturbance would occur on previously disturbed land, so the project would not cause a species to be petitioned for listing under the *Endangered Species Act*. Cumulative impacts to special status and sensitive species would not be significant.

3.14.8 Cultural Resources

No NRHP-eligible cultural resource sites were identified during the current Class III cultural resource inventory for the project, so no significant cumulative impacts to cultural resources would occur.

3.14.9 Land Use, Transportation, and Recreation

Wind power generation also occurs as a land use to the west of Peetz, so the proposed project would add incrementally to the extent of electric generation in the area. Other land uses would be impacted only slightly (e.g., a loss of about 222 acres of cropland, CRP land, and native prairie) and cumulatively, would not be significant. Traffic would increase, but the overall transportation system should be able to handle project-related traffic along with the other uses without significant adverse effect. Construction of the wind project west of Peetz resulted in minor rutting on gravel roads within the wind project, but no unacceptable road damage occurred (personal communication, March 2005, with Chad Wright, Logan County Road and Bridge Department). Recreational opportunities are presently controlled and will continue to be controlled by the private landowners and, thus, the project would not cause cumulative impacts to recreation.

3.14.10 Noise

Noise impacts are anticipated to be negligible, such that at distances of approximately 1,000 ft or more from the turbines, the area would not be any noisier than under current conditions. Cumulative impacts due to noise would not be significant.

3.14.11 Visual Resources

Cumulative impacts to visual resources would be similar to those described for the Proposed Action. The project would be the second wind project in the area and, thus, is compatible with the existing landscape. Cumulative impacts on visual resources would not be significant.

3.14.12 Socioeconomics and Environmental Justice

The project's socioeconomic impacts would be beneficial to the local landowners, the town of Peetz, neighboring cities, Logan County, and the State of Colorado. Cumulative impacts also would be beneficial. Cumulative development in the general area would not impact any low income or minority communities because 1) no minority communities, as defined by EPA, occur in the region and 2) Logan County and Sterling may be classified as low income, but economic/infrastructure development would have beneficial impacts to both entities.

3.15 UNAVOIDABLE ADVERSE EFFECTS

The mitigation measures incorporated in the project description and within the various mitigation sections in this chapter would avoid or minimize many of the potential adverse effects. Unavoidable adverse effects--residual impacts that would likely remain after mitigation--would include the following:

- fossils fuels and water would be consumed and labor and materials would be expended during construction and to a much lesser extent, during operation (e.g., O&M vehicle fuel). This would be offset by renewable energy produced through wind rather than consumption of fossil fuel.

- Some damage to, or illegal collection of, paleontological or cultural resources may occur.
- Up to 222 acres of soil and vegetation disturbance would occur, resulting in some soil loss and some stream sedimentation, until surface-disturbed areas are successfully reclaimed. Up to 69 acres of vegetation would be lost for the life-of-project.
- Some additional emissions of fugitive dust, sulfur dioxide, nitrogen oxides, carbon monoxide, carbon dioxide, and volatile organic compounds would occur.
- Some wildlife mortality would occur.

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